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THE NEW INTERNATIONAL ENCYCLOPÆDIA

SECOND EDITION

VOLUME IV

NEW YORK
DODD, MEAD AND COMPANY
1928

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KEY TO PRONUNCIATION

For a full explanation of the various sounds indicated, see the KEY TO PRONUNCIATION in Vol. I.

ā as in ale, fate.	ch as in chair, cheese.
â " " senate, chaotic.	d " " Spanish Almodovar, pulgada, where it is nearly like <i>th</i> in English then.
â " " glare, care, and as <i>e</i> in there.	g " " go, get.
ā " " am, at.	g " " German Landtag = <i>ch</i> in Ger. ach, etc.
ā " " arm, father.	ii " " <i>j</i> in Spanish Jijona, <i>g</i> in Spanish gila; like English <i>h</i> in hue, but stronger.
ā " " ant, and final <i>a</i> in America, armada, etc.	hw " " <i>wh</i> in which.
α " " final, regal, pleasant.	k " " <i>ch</i> in German ich, Albrecht = <i>g</i> in German Arensburg, Mecklenburg, etc.
a " " all, fall.	ñ " " in sinker, longer.
ē " " eve.	ng " " sing, long.
ē " " elate, evade.	n " " French bon, Bourbon, and <i>m</i> in the French Étampes; here it indicates nasalizing of the preceding vowel.
ē " " end, pet.	sh " " shine, shut.
ē " " fern, her, and as <i>i</i> in sir, etc.	th " " thrust, thin.
e " " agency, judgment.	th " " then, this.
e " " ice, quiet.	zh " " <i>z</i> in azure, and <i>s</i> in pleasure.
i " " quiescent.	
i " " ill, fit.	
ī " " old, sober.	
ō " " obey, sobriety.	
ō " " orb, nor.	
ō " " odd, forest, not.	
o " " atom, carol.	
oi " " oil, boil.	
ōō " " food, fool, and as <i>u</i> in rude, rule.	
ou " " house, mouse.	
ū " " use, mule.	
ū " " unite.	
ū " " cut, but.	
u " " full, put, or as <i>oo</i> in foot, book.	
ū " " urn, burn.	
y " " yet, yield.	
B " " Spanish Habana, Córdoba, where it is like English <i>v</i> but made with the lips alone.	

An apostrophe ['] is sometimes used as in tā'b'l (table), kǎz'm (chasm), to indicate the elision of a vowel or its reduction to a mere murmur.

For foreign sounds, the nearest English equivalent is generally used. In any case where a special symbol, as G, H, K, N, is used, those unfamiliar with the foreign sound indicated may substitute the English sound ordinarily indicated by the letter. For a full description of all such sounds, see the article on PRONUNCIATION.

A PARTIAL LIST OF THE LEADING ARTICLES IN VOLUME IV

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THE NEW INTERNATIONAL ENCYCLOPÆDIA

BRÖCKELMANN, bröck'el-mün, KARL (1806-). A German university professor and aeronaut. He was born at Wiesbaden, Germany, and was educated at the local gymnasium and at the universities of Munich and Erlangen. He became professor at the University of Halle, chose photo-chemistry as a specialty, and on this subject wrote several books. He also made more than 80 balloon ascensions, taking many first prizes in aeronautics—among them several offered by the German Emperor—and writing *Wir Luftschiffer* (1909). The Aeronautic and Alpine Society of Berlin elected him a member.

BROCK'EN (*Mons Bruclerus Melibocus* of the ancient Romans), popularly known as the Blocksberg. The highest summit of the Harz Mountains. It is situated in Prussia, about 20 miles west-southwest of Halberstadt, and has an elevation of 3747 feet above sea level. The mountain is very frequently veiled in mist and is celebrated for the phenomenon known as the *Brockengespenst* ('spectre of the Brocken'), which is nothing more than the shadows of men, houses, and other objects thrown upon the misty eastern horizon by the light of sunset. The mountain is very much frequented on account of fine views obtained from its summit, which has a hotel and observatory, and is reached by a railway line constructed in 1898.

BROCKES, bröck'és, BARTHOLO HEINRICH (1680-1747). A German poet, born in Hamburg. He studied at the universities of Halle and Leyden and traveled extensively. In 1724-26 he and his friends published *Der Patriot* (4 vols.). A passion oratorio set to music by a score of composers, including Händel, made him famous. In his works he turns, with a simple religious faith, from the stilted conventional poetry of his day to the appreciation of nature, then but slightly understood. Particularly deserving of citation is his collection *Irdisches Vergnügen in Gott* (9 vols., 1721-48), which shows the influence of the Bible, Milton, and Thomson; new abridged ed. by Stiehler (1887). He translated Pope's *Essay on Man* and Thomson's *Seasons*. Consult A. Brandl, *B. H. Brockes* (Innsbruck, 1878).

BROCKET (Fr. *brocart*, from OF. *broc*, Fr. *broche*, spit, tine; cf. OF. *broquet*, dim. of *broc*). A book name of certain South American deer, because their antlers are simple spikes like

those of a yearling stag. (See ANTLER.) They inhabit Brazil, are of "small size, heavy form, and arched back." There are four species, forming the subgenus *Coassus*, and varying from 19 to 27 inches in height. One is the Brazilian deer, or guazu-viva (*Coassus nemorivagus*), and is brown, each hair being tipped with white. Another is the guazu-pita (*Coassus rufus*). A closely allied form is the diminutive venada or pudu (*Pudua humilis*) of the Chilean Andes, the smallest of all deer, with spike horns only 2½ inches long. See PUDU.

BROCK'ETT, LINUS PIERPONT (1820-93). An American author. He was born in Canton, Conn., and in 1843 graduated at the Yale Medical School. After a few years of practice in his profession he devoted himself exclusively to literary pursuits, was connected, as editor or contributor, with many magazines, and published, among other works, a *History of Education* (1859); *Philanthropic Results of the Civil War* (1864); *Lights and Shadows of the Great Rebellion* (1866; reprinted as *Scouts, Spies, and Heroes of the Great Civil War*, in 1892 and 1911); *Men of Our Day* (1868); *The Year of Battles* (1871); *Epidemic and Contagious Diseases* (1873); *The Great Metropolis* (1888).

BROCKHAUS, bröck'hous, FRIEDRICH ARNOLD (1772-1823). A German publisher, born in Dortmund, the founder of the Leipzig firm that bears his name. The encyclopedia with which he is chiefly associated (Brockhaus's *Konversations-Lexikon*) he purchased incomplete in 1808, after it had been in progress for 12 years. He completed in Altenburg a first edition in 1811, and a second was begun in 1812. The business was removed to Leipzig in 1818, and book publishing was undertaken on a large scale. Brockhaus's sons and grandsons, who succeeded him, have carried the *Konversations-Lexikon* through 14 editions, and have conducted with success similar enterprises, notably Ersch and Gruber's gigantic *Allgemeine Encyclopädie* (167 vols. since 1818, incomplete). The fifth edition of the *Kleines Konversations-Lexikon* appeared in 1910 (2 vols.). Consult H. E. Brockhaus, *F. A. B., sein Leben und Wirken* (3 vols., Leipzig, 1872-81); and the same author's *Die Firma F. A. B. von der Begründung bis zum hundertjährigen Jubiläum, 1805-1905* (Leipzig, 1905).

BROCKHAUS, HERMANN (1806-77). A German Orientalist, the third son of Friedrich Arnold Brockhaus. He was born in Amsterdam

and was educated in Leipzig, Göttingen, and Bonn, completing his studies in Paris and Oxford. In 1839 he was called as assistant professor at Jena. Two years later he became lecturer at Leipzig, and in 1848 was elected professor of Sanskrit language and literature there. His works include the first five books of the great collection of fairy tales of Somadeva, *Kathāsaritsāgara* ('The Ocean of the Flow of Story,' 1839-66); an edition (1845) of the play *Prabodhachandrodaya* ('The Rise of the Moon of Intelligence') of Krishna Miśra; and a critical edition of the *Lieder des Hüfz* (3 vols., 1854-60). In 1841 he proposed the plan of printing Sanskrit works in the Latin alphabet, and he did much in other ways to increase interest in and knowledge of the Oriental languages. He prepared the first European glossary of the Avestan language, which was appended to an edition of *Vendidad Sade* (Leipzig, 1850). In 1856 he became editor of Ersch and Gruber's *Allgemeine Encyclopädie*, and prepared vols. lxii to xcix of that work. In 1853 he founded the *Zeitschrift der deutschen morgenländischen Gesellschaft*, in which he published numerous articles relating to the languages of India, Arabia, and Persia.

BROCKPORT. A village in Monroe Co., N. Y., 18 miles west of Rochester, on the Erie Canal and on the New York Central and Hudson River Railroad (Map: New York, C 4). It is the seat of a State normal school. The village is the centre of a fruit-growing and agricultural region, and manufactures shoes, canned goods, pianos, piano cases, tractors, spraying outfits, globes, clocks, etc. The water works are owned by the village. Pop., 1900, 3398; 1910, 3579.

BROCKTON. A city in Plymouth Co., Mass., 20 miles south of Boston, on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 3). Its manufactures include shoes, lasts, mechanics' tools, rubber goods, furniture, paper boxes, pianos, etc. The city has a public library of about 60,000 volumes. First settled in 1700, and originally a part of Bridgewater, Brockton was incorporated as the town of North Bridgewater in 1821. Its present name was adopted in 1874, and a city charter secured in 1881. The government is administered by a mayor, elected annually, and a bicameral city council. The executive appoints the license commissioners, and, with the concurrence of the board of aldermen, the board of health, members of the police department, and trustees of the public library. Other officials, excepting the school committee which is chosen by popular election, are selected by the council. Pop., 1890, 27,294; 1900, 40,063; 1910, 56,878; 1913 (local), 65,000; 1920, 66,138. Consult Kingman, *History of Brockton* (Syracuse, 1895).

BROCKVILLE. The capital of Leeds Co., Ontario, Canada, taking its name from Gen. Sir Isaac Brock (q.v.); on the left bank of the St. Lawrence, about 60 miles below Kingston and 125 southwest of Montreal (Map: Ontario, J 4). It is an important railway and commercial centre, being a division point of the Grand Trunk, and the southern terminus of the Ottawa and Brockville branch of the Canadian Pacific and of the Brockville, Westport, and Northwestern, and a port of call for St. Lawrence steamers. It manufactures stoves and hardware, steam engines, agricultural machinery, carriages, etc., and has an extensive trade in cheese and butter. Brockville has a large asylum for the insane,

two well-equipped hospitals, and is the seat of a United States consulate. Pop., 1901, 8,940; 1911, 9,874.

BROCKWAY, HOWARD (1870-). An American musician and composer, born in Brooklyn, N. Y., Nov. 22, 1870. After pianoforte studies with H. O. C. Korthauer from 1887 to 1889, at the age of 20 he went to Berlin, where he continued his instrumental studies with Barth, and composition with O. B. Boise. At the age of 24 he had composed a symphony (op. 12), a ballade for orchestra, and a violin and piano sonata (op. 9); as well as a cavatina for violin and orchestra. These, together with other piano solos, were given at a concert of Brockway's own works in February, 1895, at the Berlin Sing-Akademie. A few months later he returned to New York, where he remained until 1903. In 1903-09 he was professor of composition at the Peabody Institute in Baltimore. Thereafter he made New York his residence.

BROCKWAY, ZEBULON REED (1827-1920). An American penologist. He was born in Lyme, Conn., April 28, 1827. In 1850 he entered upon prison service at the Connecticut State Prison. Thence he went to Albany Co., N. Y., as deputy superintendent of the penitentiary, and in 1854 became superintendent of the Monroe County (N. Y.) Penitentiary. In 1861 he took charge of the House of Correction, Detroit, Mich., which position he gave up in 1876 to assume the superintendency of the New York State Reformatory at Elmira. This position he resigned in 1900. In 1898 he was elected president of the National Prison Association of America, and was honorary president of the International Prison Congress meeting in Washington in 1910. He was elected mayor of Elmira in 1905. Mr. Brockway's fame as a prison reformer rests largely upon his work in introducing the indeterminate sentence at the Elmira Reformatory. The success of the indeterminate sentence in this institution was largely responsible for its wide acceptance in other prisons. Consult his book, *Fifty Years of Prison Service* (New York, 1912). See ELMIRA REFORMATORY; PENOLOGY.

BRODERICK, DAVID COLBETH (1820-59). An American politician. He was born in Washington, the son of a stonecutter; but early removed with his father to New York City, where he attended the public schools and afterward learned his father's trade. He then kept a grog shop for some time, became prominent as a leader of the rougher element in Tammany, and was chosen foreman of a volunteer fire-engine company, which had a considerable political influence. He nevertheless devoted much of his time to private study and by his moral habits and his personal integrity earned the respect of the better element in the city. In 1846 he failed to secure a coveted election to Congress, and three years later removed to California, where he soon became the recognized leader of one of the two factions into which the Democratic party in the State was then divided. He was a member of the California Constitutional Convention in 1849, and served two terms in the State Senate, for part of the time as presiding officer. In 1856 he was elected to the United States Senate and soon became conspicuous for his opposition to the admission of Kansas under the Lecompton Constitution. In 1859 he took an active part in a rancorous political campaign in California, and, challenged at its close by Judge Terry on account of certain strictures in one of

his speeches, he fought a duel on September 13, in which he was fatally wounded. His death under such circumstances caused a deep sensation in the East as well as in the West and was generally attributed to the animosity aroused among slaveholders and their political sympathizers by Broderick's unyielding opposition to the further spread of slavery, especially in Kansas.

BRODERIP, brōd'rip, WILLIAM JOHN (1789-1859). An English lawyer and naturalist. He graduated at Oxford, studied and practiced law, edited law reports, and was for 34 years a London police magistrate. He was devoted to science, and wrote the zoological articles for the *Penny Cyclopaedia*. He published *Zoological Recreations* (1848) and *Leaves from the Note-Book of a Naturalist* (1852). He was secretary of the Geological Society for many years. His great conchological collection is in the British Museum. Consult Berger, W. J. *Broderip* (Paris, 1856).

BRODEUR, brō'dēr', LOUIS PHILIPPE (1862-1923). A Canadian statesman, born at Belœil, Quebec. He was educated at the College of St. Hyacinthe and at Laval University. In 1884 he was admitted to the bar and in 1891 was elected as a Liberal to the House of Commons, retaining his seat until appointed Speaker of the House in 1901. In 1904 he became Minister of Inland Revenue in the cabinet of Sir Wilfrid Laurier (q.v.), and two years later was appointed Minister of Marine and Fisheries, in which capacity he did much to improve conditions of navigation on the St. Lawrence River. He also introduced legislation which prevented the American Tobacco Company from establishing a foothold in Canada. In 1907 and 1911, respectively, he was a delegate to the Colonial and Imperial conferences in London, and in the former year was associated with William Stevens Fielding (q.v.) in negotiating the Franco-Canadian Treaty. Upon the establishment of a Canadian naval service in 1910 he became its head. Canada was represented by him at the Imperial Defense Conference in London (1909), and at the North Atlantic Fisheries Conference held in Washington in pursuance of The Hague Tribunal's decision. In 1911 he was appointed a judge of the Supreme Court of Canada.

BRODHEAD, JOHN ROMEYN (1814-73). An American historian, born in Philadelphia, Pa. He removed with his parents to New York City in 1826, graduated at Rutgers College in 1831, and in 1835 was admitted to the bar, but soon abandoned the practice of law and devoted his attention almost entirely to the study of the history of New York. For several years after 1839 he was connected with the United States legation in Holland, and while there was appointed (1841), in pursuance of an act of the New York Legislature, to procure and transcribe documents in European archives relating to the history of the State. He devoted himself to this task with great energy and succeeded in collecting more than 5000 documents, many of which had been previously unknown to historians. "The ship in which he came back," says Bancroft, "was more richly freighted with new material for American history than any that ever crossed the Atlantic." The documents were printed by the State, under the editorship of O'Callaghan and Fernow, as *Documents Relating to the Colonial History of the State of New York* (14 vols., Albany, 1856-80). From

1846 to 1849 Brodhead was Secretary of Legation in London, George Bancroft then being the United States Minister to England, and from 1853 to 1857 he was naval officer of the port of New York. His reputation rests chiefly on his *History of the State of New York* (2 vols., 1853-71), which is notable for its thorough scholarship, its candor, and its painstaking accuracy, and which, though left incomplete, remains the standard work for the period covered—1609-91. Brodhead also published *An Oration on the Conquest of New Netherland* (1864) and an address entitled *Government of Sir Edmund Andros over New England* (1867).

BRODIE, ALEXANDER OSWALD (1849-1918). An American army officer, born in St. Lawrence Co., N. Y. He graduated from West Point and was appointed a first lieutenant of cavalry in 1875. Two years later he resigned, engaged in the cattle trade in Kansas, and later took up mining and engineering in Arizona. During this period he was a second time enlisted (1883-84), serving in two Indian campaigns. At the outbreak of the Spanish-American War he became a major in Theodore Roosevelt's "Rough Riders," saw fighting in Cuba and elsewhere, and was promoted to be lieutenant colonel. In 1902 he was appointed temporary Governor of Arizona; in 1905 he became assistant chief of the Record and Pension Office (rank of major) and then military secretary (lieutenant colonel), and in 1907 adjutant general.

BRODIE, SIR BENJAMIN COLLINS (1783-1862). An English surgeon. He studied under Sir Everard Home at St. George's Hospital and was surgeon there, having previously lectured both on anatomy and surgery. In 1810 he was elected to the Royal Society, in 1811 received its Copley medal for physiological papers, and in 1858 was elected president. He became professor of comparative anatomy in the Royal College of Surgeons in 1819, and later president. He was attending physician to George IV. William IV made him sergeant surgeon (1832) and a baronet (1834). He was sergeant surgeon to Queen Victoria. He was one of the leaders in England of the opposition to homoeopathy and to Gall's "phrenology." His work on diseases of the joints promoted conservative treatment and decreased the frequency of amputations. He was an able diagnostician and a cool steady surgeon, but his passion was prevention of disease. He wrote two volumes of *Psychological Inquiries* (1854; 1862). His professional papers, with his *Autobiography*, were collected (1865) by Hawkins. Consult Acland's biography (London, 1864).—His son, SIR BENJAMIN COLLINS BRODIE (1817-80), became eminent as a chemist and studied particularly the constitution of carbons. In 1855 he was elected Aldrichian professor of chemistry at Oxford, his Alma Mater.

BRODRICK, WILLIAM ST. JOHN FREMANTLE, VISCOUNT MIDLETON (1856-). An English statesman. He graduated in 1879 at Oxford, sat as a Conservative for West Surrey from 1880 to 1885, and for the Guildford division of Surrey after that year until 1906. From 1886 to 1892 he was financial secretary to the War Office. In 1895-98 he was Undersecretary of State for War, and in 1898 was appointed Undersecretary of State for Foreign Affairs. He was Secretary of State for War in 1900, and his management of the War Office during the South African War was criticised. In 1903 he was made Secretary

of State for India. He supported Lord Kitchener in his controversy with Viceroy Curzon, which led to the latter's resignation in 1905. He became an alderman of the London County Council in 1907.

BROD'SKY, ADOLF (1851-). A Russian violinist. He was born at Taganrog in the Province of the Don Cossacks, studied under Hellmesberger in Vienna, and became a member of the Hellmesberger quartet and of the orchestra of the Royal Opera in Vienna. Subsequently he undertook a concert tour, pursued further study under Laub in Moscow, and in 1875 was appointed an instructor in the Moscow Conservatory. He became director of the symphony concerts in Kiev in 1879, in 1882 a professor in the Leipzig Conservatory, and in 1891 an instructor in Scharwenka's Conservatory and concert master of the Symphony Society of New York. In 1895 he was appointed director of the Royal College of Music in Manchester, England. He appeared in concert with great success in 1881-82 in London, Vienna, Paris, and Moscow.

BRODY, bró'di (Slav. pl. of *brod*, ford, referring to the swamps around it). A town in the Austrian Crownland of Galicia, about 56 miles east-northeast of Lemberg, not far from the Russian frontier (Map: Austria, J 1). Although its commercial importance has been on the decline for several years, due to the withdrawal in 1879 of its charter as a free commercial city, it still remains a leading exchange mart between Austria-Hungary and Russia. The chief articles of commerce are grain, wool, cattle, furs, feathers, and agricultural implements, its trade being almost entirely in the hands of the Jews, who constitute two-thirds of the population. Pop., 1890, about 17,500; 1900, 17,360; 1910, 13,588.

BRODZINSKI, bród-zén'ské, KAZIMIERZ (1791-1835). A famous Polish poet. He was born at Krolowka (Galicia) and received a military training. Having joined the artillery corps a little before 1812, it was his lot to participate in the disastrous Napoleonic invasion of Russia. In 1813 he was taken prisoner by the Prussians in the battle of Leipzig. Three years later, on being liberated, he settled at Warsaw and devoted himself to the study of comparative literature. Through his mastery of German, he soon became thoroughly familiar with the works of Schiller, Goethe, and their contemporaries. In German, too, he read Shakespeare. By 1822 he had acquired so profound a knowledge of the world's literature as to become lecturer on Polish, German, and English writers at the University of Warsaw. Even before this his fame had been made by the publication of two volumes of poems, especially the idyllic *Wieslaw*, a narrative poem (modeled somewhat after Goethe's *Hermann and Dorothea*) dealing with the life of Polish peasantry and yet full of delicate sentiment, which is still much read. Indeed, Brodzinski was the first writer in Poland to discard classical literary models for the everyday life of the people all about him; he was a Polish Wordsworth, as it were, making a new path in his native literature. He knew life as well as books and gave a most wholesomely fresh impulse to modern Polish literature. Besides his original writings (of which the eight-volume edition published at Warsaw in 1872-74 is probably the best), he has added greatly to Polish literary culture by translations of the *Book of Job* and the dramas

of Schiller. Unfortunately the revolution of 1831 interrupted his literary labors. Disappointed with the outcome of the Polish insurrection, he became a Messianist, expressing the belief in one of his later works that "the Polish nation is the Copernicus of the moral world." For an account of his life and work, consult Arabazhin, *Kazimierz Brodzinski* (Kiev, 1891).

BROFFERIO, bróf-fá'rò-ò, ANGELO (1802-66). An Italian poet and publicist, born at Castelnuovo-Calcea. In 1834 he established the *Messaggiere Torinese*, and from 1840 to 1856 he edited the radical *Voce della Libertà*. Imprisoned for liberalism in 1831 and 1846, he was from 1848 until his death a member of the Parliament of Piedmont and achieved distinction as an opponent of Cavour. A prolific author of historical and political works and of memoirs, he still lives in his dialect *Canzoni piemontesi*, which are good reflections of the idealism of the revolution. Consult R. Ebranci, *A. Brofferio e il suo tempo* (Asti, 1898), and translation of *I miei tempi* by L. W. (London, 1861).

BROGLIE, brò'lyé', ACHILLE CHARLES LÉONCE VICTOR, DUC DE (1785-1870). A French statesman. He was born in Paris, Nov. 28, 1785. The family was Piedmontese, but had won distinction in the armies of France, one of its members obtaining the rank of marshal under Louis XIV, and another holding the post of commander in chief under Louis XVI. The father of Achille died in 1794 on the guillotine, but left the injunction to his son to remain faithful to Liberty even though she was ungrateful and unjust. "His father murdered, his mother in prison, his property confiscated and plundered, the young De Broglie first appears in life in wooden shoes and a red cap of liberty, begging an assignat." His mother having escaped and remarried, Broglie was carefully educated by his stepfather. Early in life he was a member of Napoleon's Council of State, and was detailed by the Emperor on several diplomatic missions. Broglie entered the House of Peers in 1815, just before he was 30 years old. At the trial of Marshal Ney he alone had the courage to speak and vote for acquittal on the ground that the Marshal was not guilty of premeditated treason. During the Restoration he acted with the doctrinaires, of whom Guizot was the ablest representative. In 1816 he married Mme. de Staël's daughter Albertine. About the same time he became the ally of Clarkson and Wilberforce in the antislavery cause. In Louis Philippe's first cabinet he was Minister of Public Worship, and in 1832 succeeded Casimir Périer as Minister of Foreign Affairs. In 1835 he was the head of the cabinet. At this time the restrictive September Laws were passed, although Broglie had long advocated greater freedom for the press. His ministry fell because of his desire to indemnify the United States for shipping losses under Napoleon. Riding beside the King when Fieschi's attempt on the life of Louis Philippe was made, Broglie received one of the bullets through his coat collar. He retired permanently from public life in 1836. Though not in office, Broglie preserved through life close personal and political friendship with Guizot, who made him Ambassador to England in 1847. The overthrow of the constitutional monarchy in 1848 was a severe blow to the Duke; but he consented to sit in the Republican assemblies and labored to counteract what he

deemed to be the evils of universal suffrage and to avert the coup d'état which he saw was impending. When it came, he was conspicuous as one of the bitterest enemies of the Imperial régime, though he admitted that an empire was "the government which the poorer classes of France desired and the rich deserved." His last 20 years were devoted to philosophical and literary pursuits, as the result of which he published *Écrits et discours* (Paris, 1893). With regard to the future he said, "I shall die a penitent Christian and an impenitent Liberal." He was a member of the Academy and other societies. He died in Paris, Jan. 25, 1870. Consult Guizot, *Le duc de Broglie* (Paris, 1872) and Broglie, *Personal Reminiscences of the Late Duc de Broglie*, trans. and ed. by Beaufort (London, 1888).

BROGLIE, JACQUES VICTOR ALBERT, DUC DE (1821-1901). A French statesman and historian, son of the preceding. His publication, in 1846, of a brilliant study, *Système religieux de Leibnitz*, brought him the place of Secretary of Embassy at Madrid and later at Rome. After the Revolution of 1848 he defended the temporal power of the Pope and moderate constitutional liberalism in the *Revue des Deux Mondes*. Then followed in 1853 his *Études morales et littéraires*, and from 1856 to 1866 his *Histoire de l'Eglise et de l'Empire romain au IV^e siècle* (6 vols.), which gave him his seat in the French Academy in 1862. In 1870 he succeeded his father as Duke, and the following year was elected to the National Assembly. In 1871 he was also appointed Ambassador to Great Britain, but was recalled by Thiers the following year. When Marshal MacMahon assumed the presidency in 1873, the Duc de Broglie became Premier and held the office until May 16, 1874. In 1876 he was elected Senator and resumed the leadership of the reactionary parties; and in 1877 he was again Premier for a few months. He achieved greater distinction as a historian than as a statesman. Among his works, other than those mentioned above, are: *Souveraineté pontificale et la liberté* (1861); *Le secret du roi: correspondance secrète de Louis XV* (1878); *Marie Thérèse impératrice* (1888); *Mémoires de Talleyrand* (1891). Consult Tagniez, *Le duc de Broglie, 1821-1901* (Paris, 1902).

BROGLIO, brô'lyô, EMILIO (1814-92). An Italian statesman and author, born in Milan, and educated at the universities of Verona and Pavia. He took part in the Revolution in Lombardy in 1848 and was appointed Secretary of the Provisional Government. In 1856 he published 25 letters to Count Cavour "On the Income Tax" (*Dell'imposta sulla rendita*, Turin, 2 vols.). He was a member of Parliament from 1861 to 1876, and from 1867 to 1869 was Minister of Public Instruction. His works include: *Studi costituzionali* (1860); *Delle forme parlamentari* (1865); *Vita di Federico il Grande* (2 vols., 1874-76).

BROGUE, brôg (Scotch, from Gael. *brôg*, shoe, hoof). A rudely formed species of shoe of many varieties, formerly used by the aboriginal Irish and the Scottish Highlanders. The name has been applied to a modern kind of shoe with a hob-nailed sole. It is also applied to the peculiar pronunciation of English that distinguishes natives of Ireland. See SHOES AND SHOE MANUFACTURE.

BROHAN, brô'an', EMILIE MADELEINE (1833-1900). A French actress, born Oct. 21, 1833, in

Paris, the daughter of Augustine Suzanne Brohan (1807-87) and the sister of Joséphine Félicité Augustine Brohan (q.v.), both well-known actresses. At the age of 15 she entered the Conservatoire, from which she was graduated in 1850 with the first prize for comedy. At her début the same year on the stage of the Comédie Française, she created the part of Marguerite in *Les contes de la reine de Navarre*, by Scribe and Legouvé, and made a great success. She was elected a *sociétaire* in 1852. Except for a two years' absence in Russia (1856-58), as a sequel to her unhappy marriage to M. Mario Uchard in 1854, she continued at the Théâtre Français till 1886, when she retired. Besides her successes in the classic repertory, notably as Elmire in *Tartuife*, and Sylvia in *Le jeu de l'amour et du hasard*, she created leading parts in a number of new plays, among them *Par droit de conquête*, *Les doigts de fée*, and *Rêves d'amour*, *Les caprices de Marianne*, *Le lion amoureux*, by Ponsard, and *Le monde où l'on s'ennuie*.

BROHAN, JOSÉPHINE FÉLICITÉ AUGUSTINE (1824-93). A French actress. She was born Dec. 2, 1824, the daughter of Suzanne Brohan, also a well-known French actress, who died in 1887. Augustine Brohan, after distinguishing herself at the Conservatoire, made, in 1841, a brilliant début at the Théâtre Français, as Dorine in *Tartuife* and Lisette in *Riviera d'eux-mêmes*. In 1842 she was elected a member of the company. Among the many plays in which she made her reputation were: *Le mariage de Figaro*; *L'Avare*; *Le bourgeois gentilhomme*; *Le malade imaginaire*; *La vieillesse de Richelieu*; *Les aristocrates*; *La famille Poisson*. She was the author of several of the short dramatic pieces, known as *Proverbes*, for private representation, and was famous for her witty sayings, such as her parody of Rohan's celebrated motto, "Coquette ne veux, soubrette ne daigne, Brohan suis." She succeeded Rachel as professor at the Conservatoire. In 1866 she retired from the theatre, owing to an affection of the eyes, and soon afterward became the wife of M. Edmond David de Gheest, who died in 1885.

BROILING (OF. *bruiller*, to boil, roast, probably from *bruir*, to roast; cf. Ger. *brühen*, to scald). A convenient and expeditious mode of cooking small pieces of meat by laying them on a gridiron over a bright fire or even on the coals themselves. The latter is perhaps the most primitive mode of preparing meat for eating, as may be supposed from the ease and simplicity with which it is managed. Broiling is, in fact, a quicker sort of roasting. The albumen of the outside being sealed up at once, the meat is rendered extremely nutritious, and therefore this process is much to be recommended.

BROKE, SIR PHILIP BOWES VERE (1776-1841). An English admiral. He went to sea at the age of 12, entered the navy in 1792, and in 1806 became captain of the *Shannon*, which his discipline brought to a high state of efficiency. In 1813 (June 1) he defeated the American frigate *Chesapeake*, commanded by Capt. James Lawrence. He was permanently disabled during the engagement, but was made a K.C.B. for his victory. Consult Brighton, *Memoir of Admiral Sir P. B. V. Broke* (2 vols., London, 1866). See CHESAPEAKE, THE.

BROKEN BOW. A city and the county seat of Custer Co., Neb., 80 miles from Grand

Island, on the Chicago, Burlington, and Quincy Railroad (Map: Nebraska, E 3). It is the centre of a productive farming and stock-raising district, and has bottling works and a creamery. The water works are owned by the city. Pop., 1900, 1375; 1910, 2260.

BROKEN HEART, THE. A tragedy by John Ford, first acted in 1629 at Blackfriars by the king's servants, and published in 1633 in quarto, under the pseudonym "Fide Honor," with a dedication to William, Lord Craven. It was reprinted in 1811 in Weber's collection of the author's works (2 vols.).

BROKEN HILL. A mining town of Yancowinna Co., New South Wales, Australia, 925 miles northwest of Sydney, 298 miles northeast of Adelaide and 16 miles east of Silverton (Map: New South Wales, A 3). The town is built on a ridge 150 feet above the plain, and has one of the richest silver lodes in the world. It has been worked since 1884. The export of silver, lead, gold, copper, and tin in the district in 1906 exceeded \$10,000,000. In that year it produced 27 per cent of the lead output of the world. Pop., 1903, 27,160; 1911, 30,972.

BROKEN WIND. See HEAVES.

BROKER (originally one who uses, manages, handles, OHG. *brāhhen*, AS. *brūcan*, ME. *bruken*, *broken*, Ger. *brauchen*, to use. For a similar development, cf. Ger. *Müller*, broker, from *mükeln*, *makeln*, to act as broker, allied to Dutch *maken*, to make; also Ger. *handeln*, to deal, bargain, from *Hand*, hand—i.e., from "handling"). An agent employed to make bargains and contracts between other persons in matters of trade, commerce, and navigation for a compensation, commonly called brokerage. When a broker is employed to buy or sell goods, he is not intrusted with the custody or possession of them and is not authorized to buy or sell in his own name. In this respect he differs from a factor. A broker is strictly a middleman, or intermediate negotiator between the parties; and for some purposes he is treated as the agent of both parties, but primarily he is deemed merely the agent of the party by whom he is originally employed. As soon as the negotiation is concluded he makes a memorandum thereof, a copy of which he gives to each party. Brokers are of various sorts, such as bill and note brokers, stock brokers, insurance brokers, merchandise brokers, real-estate brokers, ship brokers, and the like.

The insurance broker is to be distinguished from the ordinary insurance agent, who represents and acts for the insurer; the broker is either the agent of the insured or a middleman between the insured and the insurer. His business is that of procuring insurance for those who choose to avail themselves of his services, and from any company which he or the insured may select. See INSURANCE.

BROMBERG, bróm'bérk (for *Brahenberg*, the fort or hill on the Brahe). The capital of the administrative district of the same name, in the Prussian Province of Posen, situated on the Brahe, about 6 miles from its junction with the Vistula and 69 miles northeast of Posen (Map: Prussia, H 2). Its position on the Bromberg Canal, built by Frederick II, which connects the Oder and the Elbe with the Vistula, and on the Berlin-Danzig Railway, makes it an important centre of trade, principally in lumber, flour, leather, coal, and wool. The principal articles of manufacture are vehicles, furniture, soap,

candles, alcohol, and snuff. There are also breweries, distilleries, iron foundries, locomotive works, and dyeing establishments. It is governed by a municipal council of 36 members, who elect an executive board of 14. (See PRUSSIA, *Government*.) On account of its strategical position there is always a large garrison stationed there. Bromberg was founded by the Teutonic Knights. It became part of Prussia in 1772, at the time of the first partition of Poland. Pop., 1890, 41,000; 1900, 52,154; 1910, 57,585.

BROME, RICHARD (c.1590–c.1652). A minor English dramatist. He was a servant to Ben Jonson and is mentioned in the Introduction to *Bartholomew Fair*. He was accused of gathering up for his own use his master's "sweepings." He wrote 24 popular plays, the best of which are: *The Northern Lass* (1632), *The Sparagus Garden* (1640), *The City Wit*, and *The Jovial Crew, or the Merry Beggars* (first acted, 1641), remarkable for its presentation of the joys of vagabondage. Fifteen were comedies, original in plot, and with striking and realistic characters. With Thomas Heywood (q.v.) he wrote *The Late Lancashire Witches* (1634), based on a contemporary trial for witchcraft. His dramatic works were published, in 3 vols., in 1873. Consult Andrews, *Richard Brome: A Study of his Life and Works* (New York, 1913).

BROME GRASS (Neo-Lat. *bromus*, Gk. *βρόμος*, *bromos*, kind of oats, from *βιβρώσκω*, *bibrōskēin*, to eat), *Bromus*. A genus of annual or perennial grasses nearly allied to the fescue grasses. There are about 40 species, mostly found in the north temperate zone, although some are found in South America. Some of the species are of considerable economic importance, while others are troublesome weeds. The brome grasses grow upon light soils and are quite resistant to drought. On this last account several species are highly valued in the semi-arid regions of the Great Plains, where they furnish considerable hay and forage. One of the best for this purpose is the smooth brome grass (*Bromus inermis*). This species is a native of Europe, grows to a height of 2 to 5 feet and, being perennial, soon completely occupies the land to the exclusion of all other plants. A somewhat similar species is the annual, Schradler's brome grass, or rescue grass (*Bromus unioloides*), of South America. In some of the Southern States it is considered one of the best winter grasses for pasturage. *Bromus erectus*, a native of southern Europe, is considered a valuable grass for dry limestone regions. The soft brome grass (*Bromus mollis*) is a native of England and introduced into the United States. It has soft, downy leaves, which are readily eaten by cattle, but neither the quality nor the quantity of the herbage is very high. The seeds of this and other species have been reputed to be poisonous, but the evidence is not conclusive.

The giant brome grass (*Bromus giganteus*) produces a large amount of fodder in England, but cattle do not seem to relish it. *Bromus secalinus*, called "rye brome," "chess," and "cheat," is a troublesome weed in fields of wheat and rye. The seeds retain their vitality for a long time and frequently appear in grain fields where from some cause the cereal has been destroyed. To this fact the somewhat common belief that "wheat turns to cheat" is to be attributed. That there is no foundation for such an idea is easily

demonstrated. A number of species are very ornamental, and *Bromus briziformis* is sometimes grown for winter bouquets.

BROMELIA (after the Swedish botanist *Bromel*). A genus of monocotyledonous plants, the type of the family Bromeliaceæ (q.v.). The bromelias are West Indian and Brazilian in origin, but some have been introduced into other countries for the fibre they yield. *Bromelia pinguin*, called the wild pineapple, is a very common species. It is valuable as a hedge plant, the rigid, spiny leaves resisting perfectly the attacks of animals. The leaves are very numerous, 5 to 6 feet long and 2 inches wide, tapering gradually to the tip. Another and perhaps more valuable species is *Bromelia sylvestris*. It has leaves 3 or 4 feet long and 1½ inches in width. The fibre of this is believed to be superior to that of *Bromelia pinguin*. The fibre of a number of other species has been more or less favorably reported upon, but so great is the confusion of the species that their botanical origin cannot be definitely stated. The fruits of some of the wild species of Bromelia are used for various purposes.

BROMELIACEÆ (for derivation see BROMELIA). The pineapple family. An order of mostly stemless monocotyledonous plants, or with short stems, and rigid, channeled, and often spiny, fleshy leaves in rosettes. The flowers are borne in panicles or racemes on flower stalks springing from the cluster of leaves. As a rule the three-parted flowers have highly colored bracts subtending them. There are about 40 genera and 400 species belonging to this order, most, if not all, of which are indigenous to tropical America. Some are terrestrial plants, living in dry situations, but most live attached to trees, not as parasites, but as epiphytes, and they form a very conspicuous feature of the flora of Brazil and elsewhere. The leaves of many are channeled above, and as they overlap below they hold considerable water in their funnels or pitchers. This habit and their abundant seed make them especially adapted to their epiphytic method of growing. In the water cups or funnels are found all sorts of debris, and in Venezuela a species of bladderwort (*Utricularia*) often grows in these situations. These plants often send out roots, but it is considered doubtful whether they have much use, aside from aiding in attaching the plant to its support. Some species show especial adaptations for the reduction of transpiration from their leaves. This is secured by the presence of a thickened cuticle, or by covering the leaves with peculiar scales, rendering the leaves scurfy. In the case of the common Spanish or New Orleans moss (*Tillandsia usneoides*), which hangs in such peculiar bunches from the trees of the Southern States, the stems are reduced to threadlike strands of a grayish color, covered with scales. From this plant is obtained much of the so-called hair used in mattresses and furniture. To this order belongs the pineapple (q.v.), which is useful for its fruit as well as for the fibre which is secured from its leaves. This fibre is useful for many purposes, and the finer qualities make the piña cloth of the East Indies. This is often confused with "grass cloth," from which it can be distinguished by microscopical examination; the piña fibre is said to be without any twist. Piña fibre is obtained from *Bromelia sylvestris*, a member of this order, as well as from other plants. According to Wittmack's

classification, the chief genera of this order are: *Bromelia*, *Ananas*, *Billbergia*, *Heliconia*, *Pitcairnia*, *Puya*, *Dyckia*, and *Tillandsia*.

BROMELIN. See ENZYME.

BROMIC ACID (see BROMINE), HBrO_3 . A colorless liquid with a bromine-like odor, discovered by Balard in 1826. It may be prepared by the action of bromine on silver bromate suspended in water. The latter is made from potassium bromate, which is readily obtained by the action of bromine on caustic potash. Bromic acid combines readily with bases forming a series of salts called *bromates*, none of which are of any commercial importance. By heat they are all decomposed with evolution of oxygen. Like the chlorates, when mixed with sulphur or charcoal, they explode by percussion.

BROMIDES, brō'mīdz or -mīdz (see BROMINE). The salts of hydrobromic acid (HBr) may be produced by the action of this acid on metals, metallic oxides, or metallic carbonates; also by the action of bromine vapor on metals. At ordinary temperatures the bromides are solid, but when heated they generally fuse and volatilize with decomposition.

The most important bromide is that of potassium (KBr). This salt is made by adding bromine to a solution of potassium hydroxide, evaporating and heating the residue with some charcoal, the latter serving to reduce the bromate (KBrO_3) at first produced along with the bromide (KBr). The only salt thus obtained is potassium bromide, and this may then be purified by re-crystallization from water. Pure potassium bromide is a colorless, translucent, crystalline salt with a pungent, saline taste; it is extensively used in medicine, both as a sedative and a hypnotic. It is much used in the treatment of epilepsy. The bromide of sodium is often preferred to that of potassium, as it is less liable than the latter to cause disturbances in the alimentary tract. Another important bromide is that of silver, which is made by adding silver nitrate to an aqueous solution of some other metallic bromide. Silver bromide is exceedingly sensitive to the action of sunlight and is consequently much used in photography.

With the exception of silver bromide, which is insoluble, and of lead and mercury bromides, whose solubility is slight, the bromides of the metals are more or less readily soluble in water. Other bromides used in medicine are ammonium bromide (NH_4Br), lithium bromide (LiBr), calcium bromide (CaBr_2), zinc bromide (ZnBr_2), and strontium bromide (SrBr_2), each having its special indication. In general these salts act as cerebral, circulatory, and respiratory depressants and find application in a wide variety of diseases, among them being delirium tremens, insomnia, migraine, tetanus, hysteria, and neuralgia. If taken over a considerable period, the bromides are apt to produce a series of symptoms, collectively denominated *bromism*, consisting of an acneiform rash, lowered cutaneous sensibility, mental dullness and depression, diminution of sexual power, and chronic fatigue.

BROMIDROSIS (Gk. βρῶμος, brōmos, a bad smell + ἰδρῶς, hidrōs, sweat), OSMIDROSIS. An affection of the sweat glands, in which the perspiration has a foul odor. For convenience, the condition of offensive perspiration from any cause is called bromidrosis. Perspiration, in ordinarily cleanly people, is practically odorless. The consumption of garlic, onions, whale oil, sulphur, phosphorus, alcohol, musk, and

other substances gives a peculiar smell in each case to the perspiration. Constipated people have sweat with a faecal odor, and some people excrete considerable urea by means of the skin. In smallpox, typhus fever, rheumatism, and pyæmia there is a distinctive odor to the skin and the perspiration. Other people have perspiration with an odor like that of orris or bananas. All the odors of sweat, except those due to drugs or food ingested, are due to decomposition of the fatty acids in the secretion. The armpits and the feet are the offending parts of the body in most cases. Internal treatment to relieve excessive sweating (hyperhydrosis) and to stimulate the action of the kidneys is generally necessary; and salicylic acid, boric acid, sulphate of zinc, and other medicaments are used locally.

BROMINE, brō'mīn or -mēn (Neo-Lat. *brominium*, from Gk. *βράμος*, *brōmos*, stench; referring to its suffocating odor). An elementary chemical substance discovered by Balard in 1826. It does not occur in the isolated state, but is found in combination with silver, as *bromyrite* and *iodobromite*; in combination with alkalis and alkaline earths, in sea and mineral waters, and in some saline springs; also in many marine plants and animals. Bromine is prepared commercially from liquors containing bromides, by treating them with chlorine, the latter being produced either from chlorides present in the same solution as the bromides themselves, or else in separate apparatus and introduced into the bromide solution subsequently. The crude bromine thus isolated may be purified by repeated fractional distillations, and, finally, by distilling with potassium bromide, for the purpose of removing any chlorine that may be present. Bromine is thus manufactured from the mother liquors of salt works, especially at Stassfurt in Germany; also at Syracuse, N. Y., Pomeroy, Ohio, the Kanawha region in West Virginia, and Michigan.

Bromine (symbol Br, atomic weight 79.92) is a dark, brown-red volatile liquid with a most irritating odor. Its specific gravity at 0° C. is 3.188. It freezes at -7.3° C. to a reddish-brown crystalline solid with a semimetallic lustre and boils at 63° C. Its critical point is 302.2° C. It is an irritant poison. It is used as a bleaching agent and as a disinfectant; also in medicine, in the manufacture of certain coal-tar dyes (e.g., *eosin*), and in chemical laboratory practice. During the year 1911, 651,541 pounds of bromine were produced in the United States, valued at \$110,902. Among the inorganic compounds of bromine are hydrobromic acid with the bromides, bromic acid with the bromates, and hypobromous acid with the hypobromites. Bromine is contained also in a large number of organic compounds.

BROMLEY, brōm'lē. A town in Kent, England, 10½ miles southeast of London, on the Ravensbourne River. Besides modern institutions there is Bromley College, an almshouse founded in 1666 by Bishop Warner, for widows of clergymen. Affiliated with it is Sheppard College, established in 1840 for unmarried daughters of such widows. There is also a fine Gothic church and a palace built in 1777. St. Blaise's well (a chalybeate spring) in the palace gardens was famous for its reputed miraculous powers before the Reformation. Pop., 1891, 21,684; 1901, 27,358; 1911, 33,646.

BRÖMSEBRO, brēm'se-brū (the river *Brömsa*

+ Scand., *bro*, O. Icel. *brū*, bridge). A village of Sweden, about 30 miles south of Calmar, celebrated for treaties concluded there between Denmark and Sweden in 1541 and 1645.

BROM'US. See *BROME GRASS*.

BROMVOGEL, brōm'fō-gel. The Dutch name in South Africa of the ground hornbill. See *HORNBILL*.

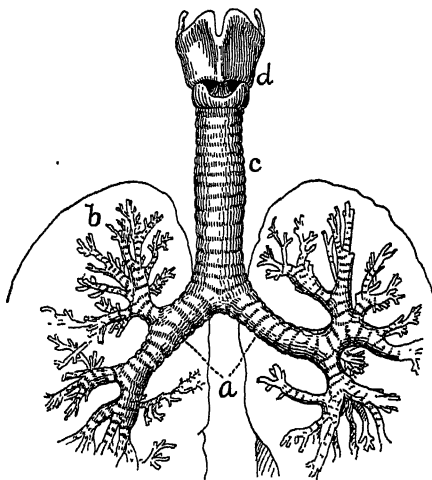
BROM'YRITE. A silver bromide which occurs as a bright yellow to greenish crust as a secondary alteration on other silver ores. It is found principally in Mexico, Chile, and Arizona.

BRONCHITIS, brōn-kī'tīs (from Gk. *βρόγχος*, *bronchos*, trachea, windpipe, *βρόγχια*, *bronchia*, the bronchial tubes). A disease of the bronchial tubes. It includes: (1) an acute catarrhal process involving the larger bronchioles; (2) an acute catarrhal process involving the smaller and capillary tubes; (3) a chronic catarrhal process involving both larger and smaller tubes; (4) an acute fibrinous process; and (5) a chronic fibrinous process. It is caused by exposure to cold or wet; irritants such as dust, coal, etc.; congestion dependent upon kidney disease, gout, or rheumatism, and even constipation, as well as heart disease. The symptoms of bronchitis are pain in the chest, fever at the outset or continuing, cough, generally with expectoration of mucus, at first scanty, later, perhaps, profuse and sometimes containing pus, shortness of breath on exertion, and occasionally, in the fibrinous varieties, the coughing out of casts of the tubes, resembling branches, of mucoid material. Various physical signs are found in the chest; but examination by a competent person alone will determine whether the attack be one of pleurisy, tuberculosis, pneumonia, or bronchitis. (See *AUSCULTATION*.) The acute form, when of the smaller tubes, may result in death. Many patients suffer with the disease every winter, and emphysema (q.v.) often coexists in these cases. In young infants lobular pneumonia (q.v.) regularly accompanies capillary bronchitis, which is also a frequent occurrence in cases of epidemic influenza (*la grippe*). There are hereditary tendencies and individual predispositions which operate in some cases. On the approach of an attack the patient should take a hot bath, go to bed, and take a purgative. Inhalation of hot-water vapor, through the small end of a funnel inverted over a vessel containing very hot water, relieves the irritation which causes coughing. Twenty drops of compound tincture of benzoin added to a pint of hot water will aid in making the inhalations soothing. Preparations of opium taken unadvisedly may do much harm. The daily cold sponge bath is an efficient preventive of bronchitis; it is best taken when the skin is warm and relaxed, immediately after rising from the bed in the morning. Ventilation and the avoidance of overheating rooms in winter, the avoidance of wetting the shoes—either soles or uppers—and abstinence from alcoholic beverages, will do much to prevent acute bronchitis. Abnormally narrow nostrils in adults, and enlarged tonsils and adenoid vegetations in children, are predisposing but easily removable causes. See *INFLUENZA*. Consult Osler, *Principles and Practice of Medicine* (New York, 1907).

BRONCHO-PNEUMONIA. See *PNEUMONIA*.

BRONCHUS, brōn'kūs (Neo-Lat. from Gk. *βρόγχος*, *bronchos*, windpipe). One of the sub-

divisions of the trachea, or windpipe. Opposite the fourth dorsal vertebra the trachea divides into two branches, or bronchi, which are similar in structure to the trachea itself. They are nearly round and cartilaginous in front, and flat, with muscular and fibrous tissue, behind, and are lined with mucous membrane. Of these



a, the bronchi; b, small bronchial tubes; c, the trachea; d, the larynx.

bronchi, one goes to each lung, the right being little more than an inch; the left, about two inches in length. On entering the substance of a lung, the bronchi divide into smaller branches, which again subdivide, until they are no larger in diameter than one-fiftieth to one-thirtieth of an inch. These are the bronchioli. At the extremity of these smaller branches and opening into them are found clusters of small polyhedral cells, the air cells, which consist of elastic tissue, with a lining of mucous membrane, and beneath the latter a layer of minute blood vessels. For further details of the histology of the bronchi, see RESPIRATION, ORGANS AND PROCESS OF.

BRONDEL', JOHN BAPTISTE (1842-1903). An American Roman Catholic divine born in Bruges, Belgium. He studied in the American College of the University of Louvain and in 1864 was ordained priest in Mechlin. In 1866 he volunteered for missionary service in America and was rector of Steilacoom, Wash., from 1867 to 1877, when he was transferred to Walla Walla. He returned to Steilacoom in 1878, became Bishop of Vancouver Island in 1879, and was appointed administrator apostolic of Montana in 1883, and in the following year became Bishop of Helena. His labors among the Indians were highly successful, and his influence among them frequently enabled him to be of great service to the national government.

BRÖNDSTED, brän'städ, PETER OLUF (1780-1842). A Danish archæologist, born at Fruering in Jutland. He studied at the University of Copenhagen. He then visited Paris, Italy, and Greece. In Greece, at Bassæ in Arcadia and in Ægina, he made excavations which furnished valuable materials for the study of classical antiquity. After his return he became professor in the University of Copenhagen. In 1818 he became envoy from Denmark to the Vatican; in 1820-21 he visited Sicily and the

Ionian Islands. He was in London in 1826 and in Paris in 1828-32. Later, he became director of the Museum of Antiquities in Copenhagen. He wrote in six different languages. His principal work was *Voyages dans la Grèce accompagnés de recherches archéologiques* (1826); in this he treated especially the island of Ceos and the Metopes of the Parthenon. In addition to several smaller archæological papers, among which were *An Account of Some Greek Vases Found near Vulci* (1832) and an account of the bronzes of Siris (1837), he also made valuable contributions to Danish history.

BRONGNIART, brö'nyär', ADOLPHE THÉODORE (1801-76). A French botanist, son of Alexandre Brongniart. He studied medicine and in 1826 received a diploma, but he subsequently devoted himself particularly to the study of the physiology of plants and also made valuable researches on fossil seeds and on the development of pollen. In 1833 he became professor of botany at the Jardin des Plantes, in Paris, and in 1834 a member of the Academy of Sciences, succeeding Desfontaines. His principal work, and one that gave him an international reputation, was his *Histoire des végétaux fossiles* (1828-47). His *Enumeration des genres de plantes cultivées au Musée d'Histoire Naturelle de Paris* (1843) played an important part in the development of the modern systems of classification.

BRONGNIART, ALEXANDRE (1770-1847). A French naturalist. In 1790 he visited England for a scientific examination of the Derbyshire mines and pottery works and, on his return to France, published a *Mémoire sur l'art de l'émailleur*. In 1797 he became professor of natural history in the Ecole Centrale. He was appointed in 1800 director of the porcelain manufactory of Sèvres, where he developed the art of painting on glass. In 1815 he was elected a member of the Academy of Sciences and in 1822 became professor of mineralogy in the Paris Museum of Natural History. His work, the *Classification des reptiles* (1797), was long the authority in herpetology, and his *Traité élémentaire de minéralogie* (2 vols., 1807) became a textbook for lecturers. In connection with Cuvier he published a famous work entitled *Essai sur la géographie minéralogique des environs de Paris* (1811). He also published in 1844 a *Traité des arts céramiques et des poteries* and other works on the products of the Sèvres establishment.

BRONN, brön, HEINRICH GEORG (1800-62). A German naturalist. He was born in Ziegelhausen and studied in Heidelberg. In 1828 he became professor in the university, and after Leuckart's departure from Heidelberg Bronn was appointed director of the zoological collection of the university. He wrote several important scientific treatises. His first was *System der urweltlichen Conchylien* (1824), which was followed by *System der urweltlichen Pflanzentiere* (1825). His most important geological work was *Lethæa Geognostica* (1836-38), on rock formations. *Allgemeine Zoologie* (1850) was the first attempt to develop zoölogy in its entirety with reference to extinct organisms. He published, in 1860, a translation of Darwin's *Origin of Species*.

BRONSART, brön'sär', HANS VON (full name HANS BRONSART VON SCHELLENDOERFF) (1830-). A German pianist and composer. He was born in Berlin, studied there under

Kullak and Dehn and in Weimar under Liszt; made several tours in Germany, France, and Russia, and directed the Euterpe concerts in Leipzig (1860-62). In 1865 he became Von Bülow's successor as director of the concerts of the Gesellschaft der Musikfreunde in Berlin; from 1867 to 1887 was intendant of the Royal Theatre in Hanover, and from 1887 to 1895 of that in Weimar. The most important of his works are compositions for the pianoforte, the best known being a trio in G minor and a concerto in F sharp minor. To these should be added a cantata, *Christnacht*, for a double choir and orchestra; *Frühlingsphantasie*, for orchestra; a choral symphony, *In den Alpen*; a symphony in C minor; a symphonic tone poem, *Manfred*; and a sextet for strings. An opera, *Der Corsar*, has remained manuscript.

BRONSART VON SCHELLENDORFF, brôn'särt fôn shél'len-dôrf, PAUL (1832-91). A Prussian general, born in Danzig. He entered the army in 1849, became lieutenant colonel in 1869, and was attached to the headquarters of the army during the Franco-Prussian War, serving as chief of division. Upon the capitulation of Sedan he was sent to the fortress to open the first negotiations with Napoleon III. In 1883 he became Minister of War. It was he who prepared the measure providing for an increase of the standing army (1887). During his term of office the repeating rifle was introduced into the infantry branch of the service, new pension laws were enacted, and the conditions of military service were modified. He wrote the following works: *Ein Rückblick auf die taktischen Rückblicke* (2d ed., 1870; Eng. trans. by H. A. Ouvry, London, 1871); *Der Dienst des Generalstabes* (1876; 4th ed., 1905; Eng. trans. under the title of *The Duties of the General Staff*, by W. A. H. Hare, 1877; new ed., 1905).

BRONTÆ/US (Gk. Βρονταῖος, brontaîos, thundering, from βροντή, brontē, thunder). An epithet of Zeus as god of lightning and thunder. See JUPITER.

BRONTË, brôn'tā. A city in the Province of Catania, Sicily, at the western base of Mount Etna, between the great lava streams of 1651 and 1843; 2600 feet above the sea, and 34 miles northwest of Catania (Map: Italy, J 10). The principal manufactures are paper and woolen goods, and the adjacent valley of the Simeto produces large quantities of grain and wine. The town is celebrated chiefly for its connection with Admiral Nelson, who was created Duke of Bronte by the Neapolitan government in 1799. Pop. (commune), 1881, 16,577; 1901, 20,366; 1911, 18,260.

BRONTË, ANNE. See BRONTË, CHARLOTTE.

BRONTË, CHARLOTTE (1816-55). An English novelist, born at Thornton, in the West Riding of Yorkshire, April 21, 1816. Her father, Patrick Brontë, a clergyman of Irish descent (the name is said to have been originally Prunty), removed, with five young children and an invalid wife, from Thornton to Haworth, in the same county, in 1820. Anne, the sixth and last child, was born the same year. Soon after the arrival Mrs. Brontë died; so that Charlotte, trying hard in afterlife, could but dimly recall the remembrance of her mother. Her father, eccentric and solitary in his habits, was ill fitted to replace a mother's love; and though their mother's elder sister, Miss Branwell, and later

the faithful servant "Tabby," entered the household, the children were left much to themselves. When Charlotte was eight years old she was sent with three of her sisters to Cowan's Bridge School, between Leeds and Kendal, which, whether deservedly or not, had an unfortunate notoriety conferred upon it 25 years later in the pages of *Jane Eyre*. The two elder sisters—Maria and Elizabeth—falling dangerously ill and dying a few days after their removal thence, Charlotte and Emily were taken out of the school. In 1831 Charlotte was sent to Miss Wooler's school at Roehead, between Leeds and Huddersfield, where her remarkable talents were duly appreciated by her kind instructress, and a friendship was formed with some of her fellow pupils that lasted throughout life. A few years later she returned to Miss Wooler's school as teacher there, and she had, soon after this, some sorrowful experiences as governess in one of the two families where she found employment. It was with a view of better qualifying themselves for the task of teaching that Charlotte and Emily went to Brussels in 1842 and took up their abode in a *pensionnat*. When Charlotte returned home for good in 1844, a new shadow darkened the gloomy Yorkshire parsonage—her father's sight was declining fast, and her only brother was becoming an inebriate.

It now seemed plain that school keeping could never be a resource, and the sisters—Charlotte, Emily, and Anne—turned their thoughts to literature. Their volume of poems was published in 1846, their names being veiled under those of Currer, Ellis, and Acton Bell; but it met with little or no attention. Charlotte's next venture was a prose tale, *The Professor*, and while it was passing slowly and heavily from publisher to publisher, *Jane Eyre* was making progress. *Jane Eyre* appeared in 1847 and took the public by storm. It was felt that a fresh hand, making new harmonies, was thrown over the old instrument. Henceforward Charlotte Brontë had a "twofold life, as author and woman." Over the latter the clouds closed thicker and thicker. Mr. Brontë had indeed recovered his sight; but Emily, the sister Charlotte so intensely loved, died in 1848. Her only brother, Branwell, also died in the same year; Anne, the youngest of the family, following in 1849. Charlotte was left alone with her aged father, in a dreary home among the graves. Nevertheless her energy never flagged. *Shirley*, begun soon after the appearance of *Jane Eyre*, was published in 1849; and *Villette*, written under the frequent pressure of bad health and low spirits, came out in 1853. In the spring of 1854 Charlotte Brontë was married to her father's curate, the Rev. A. Nicholls, who had long known and loved her. It is a relief to find that a little sunshine was permitted to the close of a hitherto clouded life. It was, however, but brief. She died March 31, 1855.

All the Brontës possessed ability akin to genius.—BRANWELL (1817-48), weakened by dissipation, left a few poems, among which are occasional lines showing the Brontë spirit.—ANNE (1820-49) died too young to achieve fame, but there is nothing commonplace about her two novels, *Agnes Grey* and *Wildfell Hall*.—The portrait of EMLY (1818-48) is drawn by her sister in *Shirley*. Having in mind, doubtless, her *Wuthering Heights* (1847) and her poems, Matthew Arnold declared that for passion, vehemence, and grief, Emily Brontë had

had no equal since Byron. Charlotte was, perhaps, less vehement, but her novels come from an aching heart. And having seen more of the world, she possessed the greater insight into character. In execution the work of all the sisters is faulty; but Charlotte's is less so than that of the others. The standard *Life of Charlotte Brontë* (London, 1857), by Elizabeth Gaskell, has been supplemented by C. K. Shorter's *Charlotte Brontë and her Circle* (London, 1896). Consult also: *Life and Works of the Sisters Brontë*, with preface by Mrs. H. Ward and an introduction and notes to the life by Shorter (7 vols., London and New York, 1900); Reid, *Charlotte Brontë* (London, 1877); L. Stephen, "Essay," in *Hours in a Library* (3d series, London, 1879); A. Birrell, *Life*, with bibliography (London, 1887); Robinson, *Emily Brontë* (Boston, 1883); Leyland, *The Brontë Family*, with special reference to Patrick Branwell Brontë (London, 1886); Shorter, *The Brontës* (London, 1907); May Sinclair, *The Three Brontës* (London, 1912; New York, 1913). In the publications of the Brontë Society will be found a mass of material of service to students of Charlotte Brontë—material bearing upon her own works and life, and upon the lives and characters of her gifted sister, her eccentric father, and her unfortunate brother.

In the London *Times* for July 29, 1913, was published a number of curious letters which passed between Charlotte Brontë and one Heger, a Frenchman who had taught her in Brussels. This man served as the original of the hero of *Villette*, who contributes so largely to the interest of that novel. The episode reflected in these letters throws a new sidelight upon the story in question.

BRONTOGRAPH (Gr. *βροντή*, *brontē*, thunder + *γράφειν*, *graphein*, to write). An instrument, and the record made by an instrument for recording the phenomena attending thunderstorms. See BRONTOMETER.

BRONTOMETER (Gk. *βροντή*, *brontē*, thunder + *μέτρον*, *metron*, measure). An instrument for studying the phenomena of thunderstorms, a "thunderstorm measurer," devised by G. J. Symons and built for him in 1890 by Richard Frères of Paris, who worked out all the constructional details. By means of seven pens the instrument permits of recording (1) a time scale, (2) wind velocity, (3) rainfall by hundredths of an inch, (4) individual lightning flashes, (5) duration of each thunderpeal, (6) hail, and (7) atmospheric pressure, as each of these occurs during the storm or the period of observation. The original instrument is provided with clockwork to drive an endless paper band 12 inches wide at the rate of 1.2 inches per minute or 6 feet per hour, about 150 times faster than is usual in meteorological recording devices. The records of the instrument as made on this band can thus be read off with certainty to a single second of time. The records are produced in part automatically, in part by recording eye and ear observations. Automatic records are made of elements (1), (2), (7), the time in minutes, the wind velocity as indicated by a Richard anemo-cinograph, and the relative changes in pressure to within 0.001 inch by a modified Richard statoscope. The remaining elements (3), (4), (5), and (6), are recorded when the observer moves the appropriate key or handle. The instrument may be more appropriately called the *brontograph* as it re-

cords or writes as well as measures the effects of the thunderstorm. Important papers on this instrument are: Symons, "On barometric Oscillations during Thunderstorms, and on the Brontometer, etc.," in *Proceedings, Royal Society*, vol. xlviii, pp. 59-68 (London, 1890); Marriott, "The Brontometer," in *Quarterly Journal, Royal Meteorological Society*, illustrated, vol. xxxiv, pp. 207-12 (London, 1908). See also CERAUNOGRAPH.

BRONTOPS. See TITANOTHERIUM.

BRONTORNIS. A genus of gigantic fossil birds from the lower Tertiary rocks of Patagonia, related to *Phororhacos* and other Stereornithes. (See BIRD, FOSSIL.) It was among the tallest of known birds. It "had leg bones larger than those of an ox, the drumstick measuring 30 inches in length by 2½ inches in diameter, or 4½ inches across the ends; while the tarsus, or lower bone of the leg to which the toes are attached, was 16½ inches long and 5½ inches wide where the toes join on." Cf. GASTORNIS.

BRONTOSAURUS (Neo-Lat., from Gk. *βροντή*, *brontē*, thunder + *σαῦρος*, *sauros*, lizard). A gigantic herbivorous dinosaur of the sub-order Sauropoda, the fossil remains of which are found in the upper Jurassic strata of Wyoming. The animal was of massive build and attained the great length of 60 feet, with an estimated weight for the live beast of 20 tons. The trunk of the body was short and thick, the neck long and slender, the tail large and strongly built, and the head remarkably small. The fore limbs were as long as the hind limbs, indicating that the animal walked on all fours, and the feet were plantigrade, i.e., the beast walked on the flat foot instead of on the toes; and the footprint covered a square yard of ground. The bones of the limbs were all solid and heavily built. In this respect they resemble those of the allied genus *Diplodocus*, while they differ from those of the majority of dinosaurs, whose bones are hollow. The long neck of the animal was probably of much use to him for feeding upon the upper portions of the aquatic plants among which he made his home, while his great bulk and small brain indicate that he was a slow-moving beast of low intelligence. For illustration of the order, see Plate of DINOSAURS.

BRONTOTHERIUM. See TITANOTHERIUM.

BRONX, THE. One of the boroughs of New York City (q.v.), comprising the section northeast of the Harlem River. It was made a separate county in 1913 and assumed its own government Jan. 1, 1914.

BRONZE (probably from Lat. *æs Brundisium*, Brundish copper). An alloy of two or more metals, the chief ingredient always being copper, with tin next in proportion. Often zinc and lead have been used; but if zinc is in greater proportion than tin, the result is not properly a bronze (see ALLOY), while lead is never present in large amounts. The bronze tools found in ancient quarries in Egypt are said to consist of 88 parts copper to 12 of tin, a hard alloy; but the supposed greater hardness which would have enabled stone cutters to work with them may have been produced by hammering, although it has been suggested that phosphorus was used and has since disappeared. (See the paragraph treating phosphor bronze, under ALLOY.) The famous mixture of antiquity called Corinthian bronze probably gained its brilliant color from a combination of copper and tin, in

a proportion of 90 of copper to 10 of tin, without other admixture.

Bronze is peculiar, in that the alloy shrinks and occupies much less space than the aggregate of the separate metals. Probably because of this shrinking, involving some interpenetration of the atoms, it is harder than either copper or tin. It has the peculiarity of filling the mold perfectly, because when melted it is very fluid—much more so than copper by itself. Bronze is easy to work with the tool. If used in thin sheets, it is one of the best metals for repoussé work, yielding regularly and evenly, and taking from the chasing-tool a beautiful and lasting finish. It takes from exposure to the weather, and especially to the earth in which it may be buried, a singularly beautiful green or greenish-blue color and a slightly powdery texture, which constitutes what the ancients called the *æruo nobilis*, the moderns, the patina. It is possible to anticipate the action of such natural causes and to give to the surface of the bronze an artificial color, as by the use of a "pickle," or by exposing it when red-hot to certain vapors. Thus, a jet-black patina is obtained by sulphur fumes. The Japanese and Chinese produce ornamental bronzes, especially vases, platters, and the like, which are colored in clouded, mottled, and veined combinations, sometimes of vivid red with different shades of brown and of yellow. Sometimes these carefully prepared decorations of the surface produce an effect similar to that of crystallization.

Mechanical Uses. As bronze gives very perfect castings, and is proof against the destructive property of the moisture of the air, it has been always used in bell casting (see BELL) and much for the supports and mountings of astronomical instruments and for cannon. This last use was common in Europe during the time of the Renaissance, and bronze cannon of the sixteenth century are remarkable for the beauty of their surface decoration, which includes sometimes the whole breech of the gun, and even the rings or staples which were used in early days to support the gun upon its carriage. All the varieties of alloy introduced since 1850 for mechanical purposes are used in the making of machinery and the like and never or very rarely in the fine arts.

Use in Art. Bronze has been in use for decorative purposes from prehistoric times. The museums are full of bronze utensils of decorative character, representing a known period of nearly 4000 years, besides much which cannot be dated of the work of outlying and little-known civilizations. The charm of ancient, mediæval, and Renaissance bronzes is due very largely to the minute artistic and technical care which was given to each separate piece. The modern statuette, group, vase, or dish is commonly a mechanical reproduction of a model made by some artist whose supervision did not extend to the piece of bronze in question; but among the ancients each piece received the full attention of its maker, as in the case of a carving done directly by the hand, in wood or in ivory.

Processes of Casting. The earliest bronze castings were solid; but the art of making them hollow, and so saving the material and insuring a quick and even cooling, is very ancient. The process most commonly used consists in putting a rough mass of the same material as the mold into the middle of it, so that

the bronze fills only the space between them. The central core is first built up of some material capable of bearing heat, and this is brought to an approximate semblance of the form desired in the bronze. Upon this a coat of some very fusible material, such as wax, is placed, and is modeled by the sculptor into the perfect embodiment of his design. Upon this finished surface the material of the outer mold is applied in thin semiliquid coats, each dried before the next is put on. The resulting block of clay will contain a thin mask or coat, say of wax, the outside surface of which is the required work of art. The melted metal is run into this thin division between the two masses of refractory substance; the wax instantly melts and disappears, and when the bronze has hardened and the mold is broken up, the surface of the cast will be a perfect reproduction of the sculptor's design. Practically all ancient artistic work in bronze was produced in this way. The process is called in modern times *à cire perdue*, 'with lost wax'; and it is evident that only one bronze casting can be obtained from each mold so made.

During the nineteenth century the process almost exclusively used was founding with sand (more rarely with loam), invented in France in 1788. The mold is formed by pressing sand around the model in such a manner that it can be taken off in pieces. These are then fitted together and encased in an iron frame. The core is formed by placing a cast of the statue made from the same or a second mold, which is cut down to admit the thickness of metal desired. In this, as in wax casting, there must be many little canals for pouring in the metal and allowing the escape of the air. The most recent process is the galvanic, first used in St. Petersburg in 1840. In this the mold is made from the model as above, usually in some such material as plaster. It is then filled with a solution of copper, which by the action of electricity is precipitated in the mold, forming a statue of pure copper, after which the mold is broken. In both founding and the galvanic process there are always defects due to the fitting and joining of the pieces, which must be removed by skillful chiseling. The results are never as artistic as *à cire perdue*, which is at the present time replacing the others for the finest work. The repoussé process, in which thin sheets of bronze are beaten into the required shapes, has been used from the earliest to the present day in applied art and for colossal statues. See REPOUSSÉ.

Ancient Bronzes. The art of bronze casting was well known to the ancient Egyptians, who as early as the third millennium cast admirable statues, as well as weapons, utensils, and ornaments of all kinds. The excavations of ancient Assyria and Babylonia have unearthed many artistic weapons, utensils, and articles of the toilet of Babylonian origin. The highest excellence however, was reserved for the Greeks. Even in the Mycenaean period great proficiency in casting was attained. In classic times the more important works of the Greeks, excluding those connected with buildings, were in bronze, and their marbles were more commonly replicas or copies by inferior artists, used for the adornment of porticoes, gardens, or the like, while the original bronze filled its place in the temple for which it was made. As late as the reign of Vespasian there were 3000 bronze statues in

Delphi, after Nero had carried off 500 to Rome. The same tendency existed among the Romans. Bronze statues brought home by conquerors, or made by Grecian and other artists in the service of the masters of the world, filled not only Rome itself, but the other great cities of the Empire. The value of the metal, and the ease with which it could be broken up and cast or made into coins, has caused the disappearance of nearly all of these. A very few Greco-Roman bronzes have been brought to light by recent diggings and explorations; but these are nearly always utensils, tablets bearing inscriptions, and the like. Busts, and heads cut from lost statues, exist in considerable numbers. In the British Museum there are several of great interest, but these belong mainly to the period of the long-established Empire. Foremost among the surviving statues recently excavated is the "Charioteer of Delphi" in the museum of that place. In the little museum at Brescia, in Lombardy, is a bronze statue of heroic size, strongly resembling in its pose and general character the famous "Venus of Milo," and generally called the "Victory of Brescia." In the museum in Berlin there is a statue called the "Praying Boy," but the arms are restorations, although seemly and probable ones. The two or three large bronzes in the Etruscan Museum in Florence are of singular importance, especially the so-called "Orator"; they are not Etruscan in the sense of belonging to the years of the independent life of Etruria. The famous "She-Wolf" in the Palace of the Conservators in Rome is the most valuable piece of pure Etruscan bronze work known to us; the two children are sixteenth-century additions. Besides these few pieces the contents known as the Halls of the Greater and Smaller Bronzes in the Naples Museum contain the most valuable survivals of the Imperial period. In the third of the halls of larger bronzes there are 42 statues and busts, all of human subjects and of life size or larger, most of them found in the Villa of the Papyri at Herculaneum. The halls of the smaller bronzes contain many statues and groups found in the same villa, and also the vast accumulation of decorative utensils found in Pompeii. Among them is the "Sleeping" (or "Drunken") "Faun," the "Hermes" seated on a rock, the six splendid draped female figures of pure Greek type known as the "Actresses" or the "Danseuses," the busts called "Apollo" and "Ptolemy," and the priceless head which has been called "Plato" from its sweet and cheerful gravity. In all these works the textile and tenacious character of the metal is allowed to dictate the character of the design. Only detailed description would make it clear how greatly these bronze pieces differ from works carved in hard material, such as marble or close-grained stone, or even wood or ivory. From the hairdressing, in slight and thin corkscrew curls carried all around the head, and held in place by a broad band, as in the "Apollo" and the "Ptolemy," to the treatment of the thin folds of light drapery, and again to the mere pose of the figure in a position which no marble could be made to maintain, the metallic character of the design is always prominent.

Medieval and Renaissance Bronzes. The use of bronze was not entirely abandoned during the Middle Ages. The toreutic or embossed statues of certain mediæval tombs, such as that of Edward III in Westminster Abbey, are well

known. In Italy such work was more common, largely because of the Byzantine influence; and church doors, as at Benevento, Milan, and Pisa, were made as easily in a pure and graceful twelfth-century style as the primitive work of Verona and Ravenna had been achieved two centuries earlier. The tendency of the Middle Ages was, however, to use metals mainly for the decoration of objects of religious and civil ceremony. In this way bronze served as a background for enameling and for the framework of elaborate altarpieces and the like. With the classical Renaissance in Italy, however, the use of bronze in the antique manner for statuary, bas-reliefs, busts, and the like was revived. Such pieces as the doors of the Baptistery in Florence, by Andrea Pisano and by Lorenzo Ghiberti, and those of the sacristy of the cathedral near by, the work of Luca della Robbia; such statues as the "David" of Donatello, the "David" of Verrocchio, the "Perseus" of Cellini with its imaged pedestal, the "Mercury" of Giovanni Bologna; such bas-reliefs as those of Donatello in the altar of San Antonio in Padua, and as those which adorn the pedestal of the statue of Duke Cosimo in the square in Florence; such pieces of decorative art as Pollajuolo's tomb of Pope Sixtus IV and the candelabrum of the Florence Baptistery; such equestrian statues as that of Colleone in Venice, by Verrocchio, that of Gattamelata in Padua, by Donatello, and two by Giovanni Bologna, the Dukes Cosimo and Ferdinand de' Medici, in Florence, are indeed the best known of this period; but they are only a few out of a great number. Mention should also be made of the achievements of the German Renaissance during the later fifteenth and sixteenth centuries, especially at Nuremberg, where Peter Vischer (q.v.) and his sons cast admirable shrines, statues, tombs, and ecclesiastical furniture.

Baroque and Rococo. The work of the bronze caster was less actively pursued during the seventeenth and eighteenth centuries, although there was no time when important works were not in progress. During the reign of Louis XIV an important revival took place in France. Objects of interior decoration—candelabra, clocks, vases, admirable statuettes, etc.—were cast and chiseled with the highest skill. Gilded plates of bronze were used in the decoration of furniture, carriages, sedan chairs, marble and porcelain vases. This art continued to flourish throughout the following reigns, the Republic, and the Empire.

The Nineteenth Century. In statuary as well as in the decorative arts France retained her supremacy. In no other country is the use of bronze in art so common. Practically all the greatest sculptors have worked in this material. The historic styles of the preceding century were those most commonly used, but in late years *l'art nouveau* was also adopted. Much has been learned from the Chinese and Japanese, particularly in the manner of tinting bronze. In Germany bronze was at first confined to statuary, but in the late nineteenth century, following French examples, it was applied to small bronzes with great success, in connection with the new naturalistic movement. Austria has in late years accomplished much along the same lines, while in Italy the faithful reproduction of antique bronzes has been carried on. Bronze casting is practiced with success in Russia, and in almost every other European country.

The first bronze statue in the United States, that of Dr. Bowditch the astronomer, was cast in 1847 by Ball Hughes. This may have been antedated by H. K. Brown's "Indian and Panther." The first equestrian statue was that of General Jackson in Washington, cast by Clarke Mills in 1852, and not H. K. Brown's Washington (1853, Union Square, New York), as is commonly supposed. Since that time there has been great progress, particularly in the small bronzes of delicate workmanship, those cast by Tiffany excelling even the Parisian in tints.

In several of the Oriental countries, particularly where the Buddhist religion prevails, the art of bronze founding has attained high perfection. For the bronzes of China and Japan, which are unexcelled in workmanship, see CHINESE ART; JAPANESE ART.

Bibliography. A good manual of the production and process of bronzes in art is the introduction to Fortnum, *Descriptive Catalogue of the Bronzes of European Origin in the South Kensington Museum* (London, 1876). An even better and briefer manual, is Lüer, *Technik der Bronzeplastik* (Leipzig, 1902). Several important manuals have been published in French under the title *Les Bronzes d'art*, by Sarvant (Paris, 1880), Laurent-Daragon (ib., 1881), Barbédienne (ib., 1893), and Harvard (ib., 1897). Consult also Delon, *Le cuivre et le bronze* (Paris, 1877); and, for the historical epochs, Swarzenski, *Mittelalterliches Bronze-geräth* (Berlin, 1902); Murray, *Greek Bronzes* (London, 1898); Bode, *Italian Bronzes of the*

end of the Bronze period occurs in different places at widely different times. In Greece the pre-Mycenaean period is essentially a Stone age, though the use of copper and bronze begins in Cyprus during this time. (See ARCHAEOLOGY.) The Mycenaean period is marked by the use of bronze, though iron seems to have been known before this civilization passed away. Even in the Homeric poems iron is not common and is highly valued, while bronze is in common use. In Italy the Terramare of the Po valley belongs to the earlier Bronze age, but the Villanova graves near Bologna, of about 1000 B.C., show the presence of iron, and it seems likely that the Bronze age in Italy was of relatively short duration. In general it may be said that the duration and development of this period of civilization depended largely upon the accessibility of the regions where it flourished to traders from the south. Thus in France, Spain, and central Germany, with which the Greeks early came in contact through Massilia and the Rhône valley, iron was early introduced, and soon succeeded bronze for weapons and sharp tools, while in the valleys of Switzerland, among the lake-dwellers, in Great Britain and northern Europe, the use of iron was much later. Indeed some archaeologists would allow the Bronze age of Scandinavia to continue to the second century B.C., though Montelius places the commencement of the first Iron period about 500-400 B.C. The chronology of this Swedish archaeologist, a recognized authority in this field, is shown in the following table, abridged from one given in

B. C.	Central Italy	Central Europe	Great Britain and Ireland	Scandinavia and North Germany
2500-1900	Copper (and Stone)	Copper (and Stone)	Copper (and Stone)	Copper (and Stone)
1800	Bronze age	Bronze age	Bronze age	Bronze age
1000	Iron age			
800	" "	Iron age (Hallstatt)	Iron age (Late Celtic)	" "
600	" "	" "	" "	Transition to Iron age
400	Historic time	" "	" "	Iron age

Renaissance (ib., 1908); Bode, *Introduction to the Catalogue of J. P. Morgan's Collection of Bronzes* (Paris, 1910).

BRONZE, AGE OF. A term used by modern writers to denote that period in the history of mankind when iron was unknown and bronze (an alloy of copper and tin) was in general use for weapons, tools, and ornaments. That such a period existed in a large part of Europe between the later Stone age and the introduction of iron is now admitted by most archaeologists, though there is much difference of opinion in many points of detail. It should be noted that the term denotes a stage of civilization, not a chronological division, for there is no sharp line between the Stone and the Bronze ages; indeed, stone implements are common through much of the later period and are not unknown after the introduction of iron. Nor, on the other hand, does bronze cease to be used for some time after the superiority of iron has been established. The beginnings of the Bronze age in Europe are nearly synchronous, and seem to fall in the period between 2000 and 1800 B.C., as is rendered probable by the similarity of the earlier types throughout the Continent; this similarity has been explained by the theory that the knowledge of bronze on the continent of Europe was won from the East, through contact with the Phenicians or the Greeks. The

Journal of the Anthropological Institute of Great Britain, vol. xxix, p. 309 (1899), though many students of Italian archaeology hold that the dates for Italy are too remote.

Of course the Bronze and Iron ages are subdivided into many periods which have been omitted here. It should also be said that European archaeologists are by no means agreed upon the existence of a Copper age, many claiming that, while pure copper was doubtless used here and there, the discoveries have not been sufficient to warrant the belief in a general use for a considerable period of time. The existence of a Copper age in North America is conceded by all, and there is much probability that such an age existed on the island of Cyprus and in Egypt. Outside of Europe the existence of the three ages is not so clearly traced. Recent discoveries in Egypt show that stone and metal were used side by side for a long period, while some Egyptologists hold that iron was not in general use until about 800 B.C. Consult: Hörnes, *Urgeschichte des Menschen* (Vienna, 1892); Evans, *Ancient Bronze Implements of Great Britain* (London, 1881); Chantre, *Age du bronze en France* (Paris, 1875-76); Montelius, *Les temps préhistoriques en Suède* (trans. from the Swedish by S. Reinach, Paris, 1895); Morgan, *L'Age de la pierre et les métaux en l'Égypte* (Paris, 1896); Robert Munro, *Paleolithic and*

Terramara Settlements in Italy (New York, 1912); chap. iv of T. Rice Holmes's *Ancient Britain and the Invasions of Julius Caesar* (Oxford, 1907); T. E. Peet, *The Stone and Bronze Ages in Italy and Sicily* (Oxford, 1909).

BRONZE-WING, **BRONZE-WINGED PIGEON**, and **BRONZE PIGEON**. Names given in Australia to pigeons, chiefly of the genus *Phaps*, on account of the lustrous bronze color with which their wings are variously marked. They are otherwise also birds of beautiful plumage.—The **COMMON BRONZEWING**, or **bronze-winged ground dove** (*Phaps chalcoptera*), is distributed over all Australia. It is often seen in flocks, feeds on the ground, and builds its nest chiefly on low branches of trees growing on meadowlands or near water. It is a plump bird, often weighing fully a pound, and is acceptable at every table.—The **BRUSH BRONZEWING**, or **little bronze pigeon** (*Phaps elegans*), is not so plentiful nor so widely distributed, chiefly inhabiting Tasmania and the southern parts of Australia. It inhabits low, swampy grounds, never perches on trees, resembles a partridge in its habits, and makes a loud birring noise like a partridge when it takes wing on being alarmed.—The **HARLEQUIN BRONZEWING** (*Histiophaps* or *Phaps histrionica*) is found in the northwest parts of New South Wales in great flocks, feeding on seeds.—Some of the species of *Geophaps*, another genus, are also sometimes called bronzewing.

BRONZING. The process of imparting a bronzelike or antique metallic appearance to the surface of metal, as copper and brass, ivory, plaster or clay, and wood. The bronze effect on metals is frequently produced by beating bronze to thin leaves, similar to those of gold, which are then made into a paste with a size and applied to the metal. Sometimes bronze powders, such as *mosaic gold* or *aurum musivum*, which consists of equal parts of sulphur and white tin oxide melted together until they assume the appearance of a yellow, flaky powder, are employed. The many bronze powders of various names, as, for instance, *Dutch gold*, are similar to the foregoing and consist of various ingredients and are applied with size to the metal. Articles to which these various mixtures have been applied should be coated with a clear varnish, or otherwise the object will soon lose its metallic appearance. There are also a great number of bronzing liquids in which a metallic object may be dipped. They have a wide range of color as well as of composition, and formulas that are applicable to brass, copper, and zinc are to be found in the various technical receipt books. Among the well-known bronzing liquids for gun barrels is a mixture of 1 part nitric acid, 1 part sweet spirits of nitre, 2 parts alcohol, 4 parts copper sulphate, 2 parts tincture of iron chloride, and 60 parts water. The green *Patina* effect of ancient bronze is frequently imitated by coating new articles with a liquid consisting of 1 part ammonium chloride, 3 parts cream of tartar, 3 parts common salt dissolved in 12 parts of boiling water, to which is added 8 parts of a solution of copper nitrate. An antique appearance is often produced on silver by exposing it to the fumes of ammonium sulphide or immersing it in a similar solution. Ivory may be gilded by immersing it in a solution of ferrous sulphate and then in a solution of gold chloride; and to coat it with silver the ivory is dipped in a weak solution of silver nitrate, after which it is immersed in clear water and exposed to the rays

of the sun. The ivory then acquires a black color, which, on being rubbed, is changed to brilliant silver. In the bronzing of plaster or clay the figure is usually coated with an isinglass size until it will absorb no more. It is then slightly coated with gold size, and after drying, the figure is painted with bronze powder, and when completely dry the surplus powder may be rubbed off. A bronze effect is produced on wood in a somewhat similar manner. The wood is first coated with a mixture of size and lamp-black, and then a suitable bronze powder, as of Dutch metal or mosaic gold, is laid on with a brush, and when thoroughly dry rubbed with a soft woolen cloth.

BRONZINO, brôn-zē'nô, AGNOLO, or ANGIOLO (1502-72). A Florentine painter of the late Renaissance. He was born at Monticelli, near Florence, and studied at first with Raffaellino del Garbo and then with Jacopo da Pontormo, who had the greatest influence upon his art. He assisted that eccentric master, who "loved him as a son," in many of his works. He is known principally as court painter to Duke Cosimo I of Florence, with whom he was a great favorite. His religious and mythological subjects, both frescoes and canvases, are generally mannered imitations of Michelangelo; but his portraits are among the very best of his day. They depict the typical rather than the individual of his sitters, and are rendered in silvery tones with clear, sharp outlines. Those of the ducal family of Florence are among his best. They include the portraits of Duke Cosimo (Pitti Palace, Berlin, Lucca, Metropolitan Museum, New York), his duchess, Eleonora (Berlin, Turin, Uffizi), and the charming little princes and princesses in the Uffizi and Pitti collections, which are the first independent portraits of children in Florentine painting. The museums of Florence are richest in his works. Besides those mentioned above, there are in the Uffizi a "Descent of Christ into Limbo," "The Dead Christ," "Portrait of a Sculptor," and many others. He is also well represented in the galleries of Rome, Berlin, and in American private collections, such as the Gardner collection in Boston and the Gould and Havemeyer collections in New York. He was also a poet and a prose writer of some ability. Consult Forno, *La Vita e le rime di Angelo Bronzino* (Pistoja, 1902), and Schulze, *Angelo Bronzinos Werke* (Strassburg, 1910).

BRON'ZITE. A variety of the mineral enstatite (q.v.). The name "bronzite" was formerly applied to the entire species now known as enstatite.

BROOCH, brôch (variant of *broach*; ME. *broche*, OF. *broche*, a spit, It. *brocea*, split stick, from ML. *broca*, *brocus*, a spit; cf. Gael. *brog*, awl). An ornamental pin or instrument for fastening the dress, consisting for the most part either of a ring or disk or of a semicircle, there being a pin in either case passing across it, fastened at one end with a joint and at the other with a hook. Brooches were much used in antiquity, and varied in form as much as in modern times. They were worn both by men and women, and with a view both to ornament and use, from the time of Homer to the fall of the Western Empire. The oldest bit of Latin now known to be in existence is inscribed upon a brooch. See **FIBULA PRÆNESTINA**.

BROOD BODY and **BROOD BUD**. See **VEGETATIVE PROPAGATION**.

BROOK, MASTER. An alias adopted by the

jealous Master Ford in Shakespeare's *Merry Wives of Windsor*. In the disguise of this fictitious character he gains the confidence of Falstaff, who confesses that he has designs upon Ford's wife.

BROOKE, DOROTHEA. The leading character of George Eliot's *Middlemarch*, with philanthropic ideals. After an unsympathetic marriage with Casaubon she remarries and abandons her former undefined strivings.

BROOKE, FRANCIS KEY (1852-). An American Protestant Episcopal divine, Bishop of Oklahoma. He was born at Gambier, Ohio, and graduated at Kenyon College, Ohio, in 1874. He held rectorships at Grace Church, College Hill, Ohio; Christ Church, Portsmouth, Ohio; St. James, Piqua, Ohio; Grace Church, Sandusky, Ohio; St. Peter's, St. Louis, Mo. (1886-88); and Trinity, Atchison, Kans. (1888-93). He was chosen first Bishop of Oklahoma and Indian Territory in 1893.

BROOKE, HENRY (c.1703-83). An Irish author. He studied at Trinity College, Dublin, and the Temple, London, met Swift and Pope, lived at Twickenham near the latter, and in 1735 published a poem entitled *Universal Beauty*, in his manner—indeed Pope probably revised it. In his tragedy *Gustavus Vasa* (1739) he satirized Sir Robert Walpole in the person of Trollio, viceregent to King Cristiern. This play, prohibited from presentation in London, was later successfully given in Dublin as *The Patriot*. His *Earl of Essex* (1749) contained the line:

"Who rule o'er freemen should themselves be free,"

parodied by the Tory Dr. Johnson with,

"Who drives fat oxen should himself be fat."

In 1745 he was appointed by Lord Chesterfield to the post of barrack master at Mullingar, as a reward for a pamphlet written during the rising of '45. He opposed the penal laws against the Irish Catholics. He is best known by *The Fool of Quality* (5 vols., 1766-70), abridged (1780) by John Wesley, and republished with a memoir by Charles Kingsley (2 vols., 1859). It is the story of the training of a nobleman by a successful business man. Brooke wrote fables and translated (1738) three books of Tasso's *Gerusalemme liberata*. Consult Baker's preface to his edition (London, 1906) of *The Fool of Quality*; and Brooke's poetical *Works* (1792), edited by his daughter Charlotte.

BROOKE, SIR JAMES (1803-68). A Rajah of Sarawak, born at Coombe Grove, near Bath, England. His father was an employee of the Indian government. James entered the East India military service, was severely wounded in the Burmese War, and furloughed in 1826. He lost his commission through overstaying his furlough (on account of shipwreck), but coming into a large property by his father's death, he determined to devote himself to the task of putting down piracy in the Eastern seas and to establishing civilization in the islands. In this he was altogether successful, making for himself a rare and unique position as purveyor in general of civilization to a barbaric and ferocious people—and this too almost entirely by his own efforts. He purchased a yacht, trained a crew of 20 men on a preliminary cruise of three years in the Mediterranean, and in October, 1838, sailed from London for Borneo. When he arrived, Muda Hassim, the uncle of the Sultan of Borneo, was engaged in a war with some rebel

tribes of Sarawak. Brooke lent his assistance and in return received the title of Rajah of Sarawak. Brooke instituted free trade and framed a new code of laws. The custom of head-hunting was made a crime punishable with death; and piracy was so vigorously attacked with the assistance of British vessels that over £20,000 was paid in bounties for the killing of freebooters. Returning to England in 1847, Brooke was cordially received, made a Knight Commander of the Bath and an Oxford D.C.L., and appointed Governor of the island of Labuan, near Sarawak, and Consul General to Borneo. In 1857, owing to charges in Parliament reflecting upon his integrity, which were, however, declared not proven by the commission that examined them, Brooke was superseded in the governorship of Labuan. His house in Kuching, his Sarawak capital, was attacked at night by a large body of Chinese, who were irritated at his efforts to prevent opium smuggling, and he escaped with his life by swimming across a creek. He promptly assembled some natives, attacked the Chinese, defeated them in several fights, and drove them into the jungle. Upward of 2000 Chinese were killed. Returning to England soon after this, Brooke lectured in several of the chief towns on the advantage of the possession of Sarawak. Brooke returned to Borneo in 1861, but visited England again twice before his death, June 11, 1868. He was succeeded as Rajah of Sarawak by his nephew, Sir Charles Johnson Brooke, born June 3, 1829. (See BORNEO.) Consult: Jacob, *The Rajah of Sarawak* (London, 1876); Sir S. St. John, *Rajah Brooke* (London, 1899); *Life of Sir Charles Brooke, Rajah of Sarawak* (London, 1879). The private letters of Sir James Brooke (1838-53) were published in London, 1853.

BROOKE, JOHN MERCER (1826-1906). An American physicist; born at Tampa, Fla. He was educated at Kenyon College (Gambier, Ohio), graduated in 1847 at the United States Naval Academy, and in 1851-53 was stationed at the Naval Observatory, Washington, D. C. Subsequently he accompanied, as director of the astronomical department, the *Vincennes* expedition for the exploration and surveying of the north Pacific Ocean. In 1861 he resigned from the United States navy and was appointed chief of the Bureau of Ordnance and Hydrography in the Government of the Confederate States. He invented the Brooke gun, and devised the plans followed in refitting the *Merrimac* (*Virginia*) for the contests at Hampton Roads. From 1866 to 1899 he was professor of physics at the Virginia Military Institute (Lexington). He received the gold medal of science of the Academy of Berlin and contributed articles on ordnance and other subjects to technical magazines.

BROOKE, JOHN RUTTER (1838-1926). An American soldier. He was born in Pottsville, Pa., and in 1861 entered the Union service as a captain of volunteers. He soon rose to the rank of colonel and at the close of the war was commissioned brigadier general of volunteers for services during the battles of the Wilderness. He resigned from the volunteer service in 1866, became lieutenant colonel in the regular army in the same year, and in 1879 was commissioned colonel. He was commandant at Fort Shaw, Mont., from 1879 to 1888, when he was appointed brigadier general, and from 1888 to 1890 commanded the Department of Dakota, with headquarters in St. Paul, Minn. In 1897

he was appointed major general. In the same year, during the Spanish-American War, he was sent to Porto Rico, where he served on the commission to arrange for its evacuation by the Spanish troops, and in October was appointed Military Governor and commanding general of the department. From December, 1898, until December, 1899, he served as Military Governor of Cuba, and commanding general of the Division of Cuba, and from 1900 to 1902, when he retired, he commanded the Department of the East.

BROOKE, STOPFORD AUGUSTUS (1832-1916). An English clergyman and author, born at Letterkenny, Ireland. He was graduated at Trinity College, Dublin (1856), took orders in the Anglican church and, after holding various curacies in London, was made chaplain in ordinary to the Queen (1872). In 1880 he left the Anglican Communion, affirming his disbelief in the accepted doctrine of miracles. Among his works are: *Life of Frederick W. Robertson* (1865); *Theology in the English Poets* (1874); *A Primer of English Literature* (1876), which was revised and enlarged in 1896; *Sermons* (6 vols., 1868-88); *Poems* (1888); *Study of Tennyson* (1889); *English Literature to the Norman Conquest* (1898); *On Ten Plays of Shakespeare* (1905); *A Treasury of Irish Poetry in the English Tongue* (1901), edited in collaboration with T. W. Rolleston; *Poetry of Robert Browning* (1902); *Studies in Poetry* (1907); *Four Poets* (1908); *Onward Cry: Addresses* (1911); *Ten More Plays of Shakespeare* (1913).

BROOK FARM. A communistic experiment founded in 1841 at West Roxbury, Mass. The Brook Farm Association of Education and Agriculture, as it was officially styled, was an attempt to solve the social problem through the institution of equality in rewards and the adaptation of tasks to individual capacities. It grew out of the social and philosophical movement represented by the Transcendental Club, of which Ripley, Channing, Emerson, Thoreau, Hawthorne, Dwight, and Margaret Fuller were leading members. Not all of these accepted the Brook Farm plan of economic organization, but all were in sympathy with its ideals. The leading spirit in the Brook Farm Association was George Ripley. Hawthorne, Dwight, and Allen also became members.

All members, without distinction of sex, had to labor an allotted period each day, either on the farm or in the workshop attached to the main institution. All employments were paid substantially alike. All shared the same food at the same table, all owned a like portion of the property belonging to the establishment, all had equal access to its educational and literary advantages. The society trafficked with the outside world, selling its surplus produce, and educating children at a low rate of compensation. At the time of its organization the community contained about 20 members. The number grew in the first three years to about 70. In 1844 the community came under the influence of Greeley, Brisbane, and Godwin, and reorganized itself as a Fourieristic community under the name of the Brook Farm Phalanx. The community became prosperous and served as a centre of Fourieristic propaganda. In this stage of its existence it attracted wide attention and was visited by thousands of persons from all parts of the country. The community entered upon the construction of a

large building, the phalanstery, which was to furnish accommodations for its increasing membership. In 1846 the building, almost completed, was burned to the ground. The loss was a heavy blow to the society; moreover, the enthusiasm with which it had been inaugurated was waning. In 1847 the society was dissolved. Much of the celebrity attached to this organization is due to Hawthorne's *Blithedale Romance*, in which, under the guise of fiction, he has evidently utilized many of his experiences at Brook Farm. Consult: Codman, *Brook Farm Memories* (Boston, 1849); Russell, *Home Life of the Brook Farm Association* (Boston, 1900); Swift, *Brook Farm: Its Members, Scholars, and Visitors* (New York, 1900); Sears, *My Friends at Brook Farm* (New York, 1912). See COMMUNISM; FOURIER.

BROOKFIELD. A city in Linn Co., Mo., 104 miles east of St. Joseph, on the Chicago, Burlington, and Quincy Railroad. The industries include shoe factories, railroad shops, iron works, flour mills, brickyards, grain elevators, etc. (Map: Missouri, C 2). Coal is extensively mined in the vicinity and forms, with grain, farm produce, and live stock, the bulk of a considerable export trade. The water works are owned by the city. Settled about 1860, Brookfield was incorporated in 1865. Pop., 1900, 5484; 1910, 5749.

BROOKHAVEN. The county seat of Lincoln Co., Miss., 54 miles south by west of Jackson, on the Illinois Central Railroad (Map: Mississippi, E 7). It is the seat of the Whitworth Female College (Methodist Episcopal, South), opened in 1857, and has a public library and a fine Federal building. The city is the centre of an agricultural and lumbering region, has an important cotton trade (between 25,000 and 28,000 bales annually), and contains a creamery, machine shops, a cotton compress, a cottonseed-oil mill, lumber mills, sirup, building-brick, and handle and spoke factories. The water works and electric light plant are owned and operated by the city. Pop., 1900, 2678; 1910, 5293.

BROOKINGS. A city and the county seat of Brookings Co., S. Dak., 48 miles south by east of Watertown, on the Chicago and Northwestern Railroad (Map: South Dakota, H 3). It is the seat of the South Dakota State College of Agriculture and Mechanic Arts and the Dakota Deaconess Hospital. The leading manufactures are cigars, tow, flour, automobile-treads, and cement block. Grain and live stock are raised extensively in the district. It was settled in 1876. Pop., 1910, 2971.

BROOKITE (named for the English crystallographer, H. J. Brooke). A yellowish to reddish brown and black titanium dioxide that crystallizes in the orthorhombic system. Large crystals of it are found in the Tirol, and a variety, called arkansite and consisting of thick black crystals, is found at Magnet Cove, Ark.

BROOKLINE (*Veronica beccabunga*). A species of speedwell. It is common in ditches, brooks, and wet places in Europe. In the United States, *Veronica americana*, which is sometimes called the American brooklime, occupies similar situations. It is a perennial plant, with mostly pedicled, ovate, or oblong leaves, and bluish flowers in auxiliary racemes.

BROOKLINE. A town in Norfolk Co., Mass., including the villages of Cottage Farm, Longwood, Coolidge Corner, and Reservoir, 3 miles

southwest of Boston, on the Boston and Albany and the New England railroads (Map: Massachusetts, E 3). It is one of the most beautiful suburbs of Boston, with which it is connected by electric railroads. Brookline has a large public library of over 80,000 volumes, a municipal and several private hospitals, public baths, parks, a school of practical arts, and a fine golf course. There are manufactories of electrical supplies and screens of various kinds. The government is administered by town meetings. First settled as early as 1635, Brookline was known as the "Hamlet of Muddy River" until, in 1705, it was incorporated as a town under the present name. Frequent attempts have been made to annex it to Boston, but thus far have failed. In 1800 its population was only 605, and in 1840, 1265; but since it became a fashionable residence district its growth has been rapid. The water works are owned by the town. Pop., 1890, 12,103; 1900, 19,935; 1910, 27,792; 1920, 37,748. Consult Woods, *Historical Sketches of Brookline* (Boston, 1874); Bolton, *Brookline: The History of a Favored Town* (Brookline, 1897); and *Annual Publications of Brookline Historical Society*.

BROOKLYN, brūk'lin (originally, *Breuckelen*; see below). A borough of New York City, co-extensive with Kings Co., N. Y., and until 1898 a separate city, the county seat of Kings County (Map: New York, G 5). It is situated on the western end of Long Island and is separated from the island and the Borough of Manhattan by the East River, which connects New York Bay with Long Island Sound. The borough and county cover an area of 77.62 square miles; they extend north and south about 11 miles and east and west about an equal distance. The water front extends from Newtown Creek, along the East River, upper and lower New York Bay, the Atlantic Ocean and Jamaica Bay, to Old Mill Creek. The borough is thus surrounded by water on three sides. The northeast boundary is an irregular line, which is crossed by a broad range of low hills extending into Queens County. The elevation of this district varies from the tidewater marshes to a height of about 195 feet at Mount Prospect. Along the shore opposite the southern end of Manhattan Island is an irregular bluff, rising from 70 to 100 feet, known as Brooklyn Heights. The southern and larger part of the borough lies but little above the sea level.

As a community Brooklyn has always differed markedly from New York—or what is now politically known as the Borough of Manhattan—not only in the extent and character of its population, industries, and commerce, but in its social atmosphere. The population of the borough in 1910 was 1,634,351, while that of Manhattan was 2,331,542; but the percentage of native white inhabitants remained, as it always had been, considerably greater (about 10 per cent) in Brooklyn than in Manhattan. In 1909 the number of manufacturing establishments in Brooklyn was 5218, and the value of their products was \$417,223,000, while in Manhattan (and the Bronx) the establishments numbered 19,769, and the value of their products was \$1,417,089,000. Brooklyn differs socially from Manhattan in the free expression of local pride, and in the display of a more obvious air of domesticity. Results of the latter condition are to be observed in the absence or scarcity of the immense and palatial hotels, expensive

restaurants, and theatres and other places of amusement, which are characteristic of Manhattan.

The Residence Districts. Brooklyn has been called "The Sleeping Room of New York" and again "The City of Homes," as well as "The City of Churches." There are several fine residential districts along its southwestern shores, while on the southern ocean front lie the well-known Coney Island (q.v.), Brighton Beach, and Manhattan Beach. The oldest fine houses on the Heights are of brick and brownstone, and a few apartment hotels and apartment houses are also in this section. Along Clinton and Washington avenues, upper Dean Street, and other thoroughfares are arrays of fine frame and brick residences, set in open grounds, with carriage drives, trees, and flower beds, and there are similar districts on New York, Brooklyn, and St. Mark's avenues. Along Eighth and Ninth avenues, in the nower region adjacent to Prospect Park, and known as the "Park Slope," is another inviting residence district. Farther to the south are large sections containing pretty detached residences of less elaborate character; the Shore Road region, just north of Coney Island, has some of the finest residences and grounds in the borough. The electric railroads are chiefly responsible for this development, which may be expected to continue.

The Business Section. The most important commercial section of Brooklyn is that adjacent to the group of municipal and county buildings near the junction of Fulton and Court streets, and extending along Fulton Street to Flatbush Avenue, a distance of about half a mile. The public buildings referred to are Borough Hall, facing a small, triangular park in the angle formed by the joining of Fulton and Court streets; the Municipal Building, the County Courthouse, and the Hall of Records. In this neighborhood are the largest office buildings in the borough (small affairs at best in comparison to the huge structures along lower Broadway in Manhattan); and the Federal Building (inaccessibly situated in narrow Washington Street), a fine granite edifice in the Romanesque style, containing the Post Office, United States courts and other Federal offices. The Fulton Street section above mentioned includes a compact shopping district, in which are several of the best equipped department stores in the greater city. Another shopping district lies along Broadway in Williamsburg.

Inter- and Intra-Borough Transit. The surface and elevated street-railway service of Brooklyn is privately owned and operated, chiefly by one corporation. There are about 70 surface lines, 10 of which are operated partly or entirely on elevated tracks, besides the subway service of the Interborough system (from Manhattan), extending (in 1914) to the Long Island Railroad Station, at Atlantic and Flatbush avenues. (For a description of the proposed subway extensions in Brooklyn, see *NEW YORK CITY*.) With a few exceptions a five-cent fare, including transfer from one line to another, prevails on all of these systems. The service is not uniformly efficient, partly because of the natural obstacles to be overcome in operating so many converging lines over so large an area. The greatest difficulty is that of handling the enormous traffic to and from Manhattan in the "rush hours" of the morning and evening, for virtually all of this must be

carried over or under the river by three bridges and one tunnel. The three bridges are the Brooklyn Bridge, from Park Row, Manhattan, to Sands and Washington streets; the Williamsburg Bridge, from Clinton Street, Manhattan, to Havemeyer Street; and the Manhattan Bridge, from the Bowery and Canal Street, Manhattan, to Nassau Street. Electric cars and elevated trains cross the Brooklyn and Williamsburg bridges, and there is electric-car service on the Manhattan Bridge. (See BRIDGE.) Former ferry service between the two boroughs was greatly reduced as the result of the competition of the additional bridges and the subway tunnel from Wall Street to Borough Hall. In 1914, 11 of these ferries remained in operation.

Parks, Boulevards, and Cemeteries. Brooklyn has 30-odd public parks, containing 1126 acres, and 20 or more parkways. In the older closely built section the largest, Washington or Fort Greene Park, is in the Hill district, on the site of the Revolutionary earthworks known as Fort Greene. This park contains only about 30 acres, but has been called the most beautiful small park in the United States. The crest of the hill affords a magnificent view of the first city and one of the finest harbors in America, the navy yard, and other points of interest. From this point the ground slopes in grassy terraces, beneath which are the remains of the American Revolutionary prisoners who died on the prison ship *Jersey*. South from the older sections, but near the present geographical centre of the borough, is Prospect Park, the largest of the Brooklyn parks, which takes rank with Fairmount, Central, and Druid Hill parks among early examples of municipal enterprise in this field. Prospect Park is not so large as those of some cities, but its 526 acres contain many natural beauties in its lake, fine old trees, wooded hills, and broad meadows; while its drives, ponds, playgrounds, gardens, and other embellishments have been laid out with taste and care. The lake, of 61 acres, is attractive for boating in summer and for skating in winter; and Lookout Hill, 185 feet above the sea, commands an extensive view of New York Harbor and Long Island. The principal entrance is at Flatbush Avenue, and the circular plaza in front is adorned by a large fountain and the imposing memorial arch in honor of the soldiers and sailors of the Civil War, surmounted by a large quadriga by Frederick Macmonnies. Within the park, near the entrance, is a statue, also by Macmonnies, of J. S. T. Stranahan, the creator of the Brooklyn park and boulevard system. At other points are statues of Lincoln, J. Howard Payne, Thomas Moore, and Washington Irving. A tablet in Battle Pass commemorates the battle of Long Island, and a monument on the slope of Lookout Hill, the memory of the 400 Maryland troops who fell in that battle, a great part of which was fought within the park limits. From the Plaza east runs a boulevard 200 feet wide, called Eastern Parkway. Near the southern entrance begins the Ocean Parkway, a fine speedway with separate paths for bicycles and horses, leading to Coney Island, $5\frac{1}{2}$ miles distant. There are also, in various other sections, smaller preserves, of which Tompkins, Winthrop, and Bedford parks are examples.

West of Prospect Park, on a high ridge overlooking the bay, is Greenwood Cemetery, of 478 acres, the principal burying ground in Brooklyn

and one of the most beautiful in the country, rich in handsome monuments and mausoleums. Famous men who have been buried here include: S. F. B. Morse, Roger Williams, Elias Howe, Henry Ward Beecher, DeWitt Clinton, Horace Greeley, Peter Cooper, Henry George, James Gordon Bennett, and Henry Bergh. The Cemetery of the Evergreens (about 375 acres), and Cypress Hills Cemetery (400 acres), also, are worthy of mention.

Churches, Charities, Schools, and Libraries. Brooklyn has long been noted for the number of its churches, the beauty of its church edifices, and the ability and eloquence of many of its clergymen. A recapitulation for the year 1912 gives the number of church organizations and sects represented as 49; the aggregate number of contributing members, 603,475, and the value of the church property, \$42,531,466. According to this source, the Roman Catholic church had 113 congregations, 448,705 parishioners, and held church property valued at \$18,756,000. Other statistics from the same source are as follows: Protestant Episcopal, congregations, 86, contributing members, 25,030, property, \$4,714,900; Baptist, congregations, 52, contributing members, 20,726, property, \$2,715,000; Methodist Episcopal, congregations, 54, contributing members, 19,741, property, \$3,289,500; Lutheran congregations, 64, contributing members, 21,531, property, \$2,750,800; Presbyterian, congregations, 49, contributing members, 18,649, property, \$2,550,000; Congregational, congregations, 38, contributing members, 17,900, property, \$2,393,500. Plymouth Church, made famous by Henry Ward Beecher (q.v.), and the Church of the Pilgrims, of which Dr. Richard Salter Storrs (q.v.), another able and brilliant preacher, was pastor for many years, are still standing on the Heights. Other widely known Brooklyn preachers were: Theodore L. Cuyler, A. J. F. Behrends, and T. DeWitt Talmage.

In addition to the private charities of the churches, many of the charitable institutions have ecclesiastical relations. There are also many institutions which are entirely undenominational, notably the Young Men's Christian Association, the Naval Branch of the same, and the Young Women's Christian Association, each of which occupies commodious and finely equipped quarters. Brooklyn has about 20 free dispensaries, about the same number of homes for the aged, about 50 institutions for the relief of children, several homes for incurables and consumptives, and an inebriates' home. Of the 30-odd hospitals, the Long Island College, Brooklyn, St. Mary's, St. Johns, and St. Peter's are especially noteworthy. In the Flatbush district are the county almshouse, hospital and asylum for the insane, the last named now a part of the State system.

Brooklyn has many educational institutions, both public and private, of recognized excellence. The public-school system includes the Erasmus Hall High School, a Manual Training High School, a Commercial High School, and Girls' and Boys' High schools, besides a training school for teachers, and a truant school. Of the private institutions, there are the Polytechnic Institute, an outgrowth of the Brooklyn Collegiate and Polytechnic Institute (founded in 1853), and comprising two general departments, the College of Engineering and the Preparatory School (enrollment in the college in 1912, 664);

the Packer Collegiate Institute, for girls and young women (established in 1853), consisting of collegiate, academic, and elementary departments (total enrollment in 1913, 674); the Pratt Institute, "to promote industrial education" (founded in 1887), admirably equipped for its purposes (enrollment in 1913: day classes, 2552; evening classes, 1672); Adelphi College (opened in 1896) has 402 students (both sexes) and 604 in the academy connected with it; St. Francis' College (1858) and St. John's College (1870)—the two last named, Roman Catholic institutions—the Long Island College Hospital, and the Brooklyn College of Pharmacy.

An educational enterprise of great credit to the community is the Brooklyn Institute of Arts and Sciences, an outgrowth of the Apprentices' Library Association. General Lafayette laid the corner stone of this Association's building in 1824. Since 1888 the Institute has been under the direction of Prof. Franklin W. Hooper (q.v.). In 1914 it embraced 30 departments. The museum building, an imposing and commodious structure at Eastern Parkway and Washington Avenue, near the main entrance of Prospect Park, was opened in sections between 1897 and 1911 and has three departments, Fine Arts, Ethnology, and Natural History. The Fine Arts department contains, in addition to the original Tissot collection of paintings illustrating the life of Christ, the John S. Sargent collection of water colors, the Wallace collection of Barye bronzes, the Samuel P. Avery collection of Cloisonnes, the Alfred Duane Pell collection of European china, the Robert B. Woodward collection of ancient glass, with large collections of paintings of the Italian, Spanish, French, German, English, and American schools. The Brooklyn Botanic Garden occupies 42 acres adjacent to the museum, and is established both for the purpose of giving instruction to students in the public and private schools, and for promoting original research in botany. The Children's Museum in Bedford Park is visited by over 200,000 school children in a year.

The Brooklyn Public Library (under a public administration distinct from that of the New York Public Library) includes 31 branches, scattered throughout the borough and housed in suitable buildings, about one-half of which were paid for by Andrew Carnegie. In 1913 the collection contained about 740,000 volumes, of which about 220,000 were available in the efficiently administered Main Branch on Montague Street, near Borough Hall. (In that year the foundation of one section of the fine new library building was laid at the corner of Flatbush Avenue and Eastern Parkway.) Near at hand (at Pierrepont and Clinton streets) is the valuable collection (about 77,000 volumes) of the Long Island Historical Society. The Pratt Institute also includes a good public library of about 100,000 volumes.

Theatres and Clubs. Brooklyn has few theatres of consequence: the principal ones are the Montauk, the Broadway, and the Majestic, besides which there are several vaudeville houses and numerous moving-picture resorts. The bulk of the population in search of such diversion has always gone to New York for it. The borough has, however, several musical associations of considerable merit, and the community manifests much appreciation of the highest forms of that art. The leading institution of this

character is the Academy of Music, which occupies a handsome building on Lafayette Avenue, including an opera house, a music hall, and a lecture hall.

The essentially domestic character of the population, above referred to, is again suggested by the relative fewness of social clubs. Some of the better known of these are the Brooklyn, Hamilton, and Crescent Athletic clubs, on the Heights; the Lincoln and University on the Hill, and the Montauk on the Park Slope.

Trade and Industry. Brooklyn is one of the most important manufacturing communities in the United States. The main industrial district lies along the East River, chiefly north of the Brooklyn Bridge. Of the five boroughs which constitute the city of Greater New York, it ranked next, in manufacturing importance, to Manhattan, in 1909, with products valued at 20 per cent of the aggregate value of those of the entire city. The total value of the borough's manufactured products in 1890 was \$270,823,754; in 1904, \$342,127,124, an increase of 26.3 per cent; and in 1909, \$417,223,770, an increase of 11 per cent. This increase, however, was much less than that shown by the other boroughs. The chief industry is the refining of sugar. The twelfth census of the United States records that about one-half of the sugar consumed in the country was refined in Brooklyn and valued the product at \$77,042,997 in 1900. According to the same authority the milling of coffee and spices was also an important industry in the borough, the value of that product in 1905 being \$15,274,092. In order to avoid disclosing individual operations, statistics for these industries are omitted from the thirteenth census, but it is apparent that the industries continue to be highly important in the community. The value of the product of other leading industries in the borough in 1909 was as follows: foundry and machine-shop products, \$28,137,000; men's clothing, \$19,243,000; paint and varnish, \$15,743,000; slaughtering and meat packing, \$14,744,000; malt liquors, \$14,660,000; chemicals, \$10,827,000.

On Wallabout Bay, formed by a curve of the East River, lies the highly important New York Navy Yard, generally but incorrectly called the Brooklyn Navy Yard. The original site was bought for the government in 1801, and in 1824 the Secretary of the Navy recommended that there be established here a first-class navy yard. It now occupies about 144 acres, of which 45 acres are inclosed by a high brick wall. The establishment includes the parade grounds, a trophy park, the United States Naval Lyceum (founded in 1833), and the officers' quarters, together with the manufacturing plant, which comprises foundries and machine shops, and four large dry docks, 604 feet, 564 feet, 465 feet, and 307 feet long respectively. The yard employed, in 1909, 3622 wage earners, and the products were valued at \$7,032,416. Along the eastern side of the yard lies the Wallabout Market (about 45 acres), and adjoining it is the Naval Hospital, with accommodations for about 500 patients.

There are about 35 miles of water front, along which nearly 50 lines of steamships (some of them transatlantic) dock, besides a large number of tramp boats. The Atlantic Basin, opposite Governor's Island, has an area of 40 acres, with a wharfage of three miles, in which 500 large vessels can be accommodated at one time. The Erie Basin, to the south, has an area of

60 acres, and the Brooklyn Basin 40 acres. South of these are dry docks, among the largest in the United States, one dock being 600 feet long and 124 feet wide. Its grain elevators and warehouses mark Brooklyn as one of the largest shipping points in the United States, its traffic, however, being included in that for the port of New York.

Government. See *NEW YORK, Government.*

Population. 1790, 4495; 1800, 5740; 1810, 8303; 1820, 11,187; 1830, 20,535; 1840, 47,613; 1850, 138,882; 1860, 279,122; 1870, 419,921; 1880, 599,495; 1890, 838,547; 1900, 1,166,582; 1910, 1,634,351. The increase between 1890 and 1900 was 328,035, or 39.1 per cent, and between 1900 and 1910, 467,769, or 40.1 per cent. Brooklyn ranked third, among the boroughs of the city, in percentage of increase.

In 1910 the native white population, of native parentage, was 375,548, or 23 per cent of the total, as against 310,501, or 26.6 per cent, in 1900. The native whites, of foreign or mixed parentage, in 1910 numbered 663,583 (40.6 per cent), as against 482,658 (41.4 per cent) in 1900. The foreign-born whites numbered 571,356 (35 per cent) in 1910, as against 353,750 (30.3 per cent) in 1900. The number of illiterate persons in 1910 was 23,429, or 6 per cent of the total population, which is a lower percentage than that of Manhattan, but higher than that of the Bronx (4.5 per cent), Queens (4.7 per cent), and Richmond (4.9 per cent).

History. Long Island was originally occupied by 13 tribes of the Algonquin nation, the site of Brooklyn belonging to the Canarsie tribe. From them Jacques Bentyn and Willem Adriense Bennett bought, in 1636, a tract of 930 acres at Gowanus, extending from Twenty-seventh Street to New Utrecht. In 1637 Joris Jansen de Rapelje, a Walloon, bought 335 acres on Wallabout Bay, called by the settlers the "Waalbogt." The Indian name for this region was Meryckawick Bay, and the Indian name for what is now Brooklyn Heights was Ihpetonga, the highlands. In 1636 Jan Evertsen Bout settled on the "maize lands of Meryckawick" and, with others, established Breuckelen, named for a town in Holland about 18 miles from Amsterdam. In 1638 the West India Company bought the land east and southeast of Wallabout Bay, where the hamlet of Boswijck sprang up. In 1642 a ferry was established from a point near the present Fulton Ferry to Peck Slip, and a hamlet called "the Ferry" sprang up about it. In 1646 Breuckelen was organized, and the "Five Towns"—Breuckelen, Wallabout, the Ferry, Gowanus, and Bedford, inland—were united, and received a patent from Governor Nicolls in 1667. In 1651 Midwout, later Flatbush, was founded, and the first church was built there in 1665. In 1666 the first Dutch church was built in Breuckelen. After the Colony passed into the hands of the English, Long Island and Staten Island were called ridings of Yorkshire—Kings County, Staten Island, and Newtown constituting the West Riding—and this designation was used until 1683. In 1698 the population amounted to 509 persons, including 65 slaves, and at the beginning of the Revolution it was about 3500. On Aug. 27, 1776, the battle of Long Island (q.v.) was fought on the site of Brooklyn, and the village was held by the British till November, 1783. During the Revolution the British prison ships were moored in Wallabout Bay, and it is estimated that during the period 1777-83 as many

as 11,500 prisoners died of fever, starvation, and ill treatment, the mortality on board the *New Jersey* being especially great, and the sanitary conditions especially revolting. In 1799 the first newspaper in Brooklyn was started, the *Courier and New York and Long Island Advertiser*. Brooklyn was incorporated as a village in 1816 and received its charter as a city April 8, 1834. In 1848 occurred a disastrous fire, which destroyed seven blocks of buildings on and near Fulton Street. Williamsburg (to the north of Brooklyn, adjoining the East River), which had become a city in 1851, and Bushwick (including Greenpoint) were consolidated with Brooklyn in 1855. A new charter was granted in 1873, and amended in 1880 and 1881. In 1886 the town of New Lots (including East New York) was annexed: in May, 1894, the towns of Flatbush and Gravesend were annexed; and New Utrecht, on July 1, 1894. Flatlands was taken in on Jan. 1, 1896, when Brooklyn comprised all of Kings County and was the largest city in extent in the State, with an area of 66.39 square miles. Under the Act of the Legislature of 1897, creating the city of Greater New York, all of the city of Brooklyn as then existing was designated as the Borough of Brooklyn. See *NEW YORK*.

Consult: Stiles, *A History of the City of Brooklyn* (Brooklyn, 1869-70); Ostrander, *A History of the City of Brooklyn and Kings County* (Brooklyn, 1894); Powell, *Historic Towns in the Middle States* (New York, 1899); Bangs, *Reminiscences of Old New Utrecht and Gowanus* (Brooklyn, 1912); Armbruster, *The Eastern District of Brooklyn* (New York, 1912).

BROOKS, ALFRED HULSE (1871-1924). An American geologist, explorer, and writer on Alaska, born at Ann Arbor, Mich., and educated in Germany, at Harvard University, and in Paris. He became assistant geologist in the United States Geological Survey in 1898, was later engaged in geological work and exploration in Alaska, and in 1902 was chosen geologist in charge of Alaskan mineral resources. He published: *Railway Routes in Alaska* (1907); *Mining and Mineral Wealth of Alaska* (1909); *The Mount McKinley Region, Alaska* (1911); *Gold, Silver, Copper, Lead, and Zinc in Western States and Alaska* (1913).

BROOKS, CHARLES WILLIAM SHIRLEY (1816-74). An English author. He was admitted to the bar, but became a reporter for the *Morning Chronicle*, for which he investigated conditions in Russia in 1853, writing *The Russians of the South* (1854). He was an editor of the *Illustrated London News*, and he wrote several dramas, including *The Creole* (1847) and *Anything for a Change* (1848); and the novels, *The Gordian Knot* (1860) and *The Silver Cord* (1861). He was connected with *Punch*, first (1851) as contributor and then (after 1870) as editor, his contributions being signed "Epicurus Rotundus." In 1875 *Wit and Humour, Poems from Punch*, appeared. Consult Layard, *A Great "Punch" Editor* (London, 1907).

BROOKS, JAMES (1810-73). An American journalist and politician, born in Portland, Me. He graduated at Waterville College in 1828, and was principal of a Latin school in Portland. He then became the Washington correspondent of the *Portland Advertiser* and originated the idea of regular correspondence from the capital. He was a member of the Maine Legislature in 1835 and proposed a survey for a railroad from Portland to Quebec and Montreal. In 1836 he estab-

lished the *New York Express*, published morning as well as evening. He was a member of the New York State Legislature in 1847, and served in Congress from 1849 to 1853. He favored the compromise measures of Henry Clay and during the "Native-American" excitement of 1851-54 was a leader of the Know-Nothing Party. After the outbreak of the Civil War he left the Whigs and was elected to Congress in 1863 by the Democrats, remaining a member until his death. In 1872 he was censured by Congress—as he thought, undeservedly—for his connection with the Crédit Mobilier scandal. (See *CREDIT MOBILIER*.) He published, in separate form, *A Seven-Months' Run Up and Down and Around the World* (1872)—a series of letters which originally appeared in the *Express*.

BROOKS, JOHN (1752-1825). An American patriot. He was born in Medford, Mass.; studied medicine, as an apprentice, under Dr. Simon Tufts; settled in Reading, Mass., to practice his profession; and there was chosen to command a company of minutemen, which, on April 19, 1775, helped to harass the British on their retreat from Concord to Boston. He was chosen major of a Massachusetts regiment in May, and served thereafter until the close of the war, participating in the siege of Boston, in the battles of Saratoga, and in the battle of Monmouth, attaining the rank of lieutenant colonel in November, 1776, and strongly supporting Washington in the so-called Newburgh conspiracy of 1783. After the war he was frequently elected to the General Court, was a member of the convention which, in 1788, ratified for Massachusetts the Federal Constitution; was appointed district marshal and inspector of the revenue by Washington in 1795; served as adjutant general of the State from 1812 to 1815; and from 1816 to 1823, when he refused to stand for reelection, was Governor of Massachusetts. From 1792 to 1796 he was brigadier general in the United States army. He served as president of the Massachusetts Medical Society from 1817 until his death.

BROOKS, JOHN GRAHAM (1846-). An American writer and lecturer, born in Acworth, N. H. He graduated from the Harvard Divinity School in 1875 and studied at Berlin, Jena, and Freiburg; was an instructor at Harvard, a university extension lecturer in the University of Chicago, and a lecturer at the University of California. In 1893 he made a report on workmen's insurance in Germany to the United States Department of Labor. He became president of the National Consumers' League and wrote *The Social Unrest* (1903); *As Others See Us* (1908)—a summary of foreign visitors' impressions of the United States; *An American Citizen, The Life of William Henry Baldwin, Jr.* (1910); *American Syndicalism: The Industrial Workers of the World* (1913).

BROOKS, MARIA GOWEN (c.1795-1845). An American romantic poet, born in Medford, Mass., chiefly remembered as the author of *Zophiel, or the Bride of Seven* (1833). This was written in Cuba, her home after marriage. The first canto was published in Boston in 1825, and the complete poem in London in 1833, under the supervision of Southey, whom she had met on a visit to France and England in 1830-31. In *The Doctor* Southey calls her "the most impassioned and imaginative of all poetesses," and elsewhere "Maria of the West" (*Maria del Occidente*). In America the work found less favor, though Edgar Allan Poe gave it indiscriminating praise.

It was reëdited in 1879 with somewhat greater success. The poem is based on an incident in the apocryphal book of Tobit, telling of the love of a fallen angel for the Hebrew maiden Sara. It contains good passages, but is uneven. On returning to America Mrs. Brooks lived for a time at West Point, and afterward on Governor's Island. In 1843 she published the somewhat autobiographical *Idomen, or the Vale of Yumuri*, and wrote an *Ode to the Departed*. She planned also an epic, *Beatrice, the Beloved of Columbus*. In December, 1843, she returned to Cuba and remained there until her death. She was undoubtedly a woman of much, but untrained, poetic power. Consult Trent, *American Literature*, pp. 276 et seq. (New York, 1903).

BROOKS, NOAH (1830-1903). An American journalist and author. He was born in Castine, Me., and was educated as an artist. In 1854 he went West and settled in California as a newspaper man. From 1871 to 1875 he was a member of the staff of the *New York Tribune*. He became an editor of the *New York Times* in 1876, and in 1884 editor of the Newark (N. J.) *Daily Advertiser*. He retired from journalism in 1892. His publications include: *The Boy Emigrants* (1876; 1903); *The Fairport Nine* (1880; 1903); *American Statesmen* (1893; 1904); *Short Studies in American Party Politics* (1896); *The Story of Marco Polo* (1896); *Henry Knox, a Soldier of the Revolution* (1900); *Abraham Lincoln: His Youth and Early Manhood* (1901); *Boy Settlers* (1891; 1906).

BROOKS, PHILLIPS (1835-93). A Bishop of the Protestant Episcopal church. He was born in Boston, Mass., Dec. 13, 1835; graduated at Harvard in 1855, and at the P. E. Theological Seminary, Alexandria, Va., in 1859. He became rector of the Church of the Advent, Philadelphia, in 1859; of Holy Trinity there in 1862; removed to Boston as rector of Trinity in 1869; and was elected Bishop of Massachusetts in 1891. He published *Lectures on Preaching* (Yale lectures on the Lyman Beecher foundation, 1877), *The Influence of Jesus* (Bohlen lectures, Philadelphia Divinity School, 1879), and several volumes of sermons. He also wrote the favorite Christmas hymn, "O Little Town of Bethlehem." He was celebrated as a preacher and as a vigorous and independent thinker. His freedom from the ordinary sectarian trammels, his liberal views of doctrine, with his profound convictions as to vital Christian truths, and his deeply spiritual yet intensely practical preaching, gave him great influence with all denominations. Consult his biography by A. V. G. Allen (New York, 1901), Howe, *Phillips Brooks* (Boston, 1899), and W. Lawrence, *Phillips Brooks: A Study* (Boston, 1903).

BROOKS, PRESTON SMITH (1819-57). An American politician, notorious for his assault on Charles Sumner, in the United States Senate Chamber, in 1856. He was born in Edgefield District, S. C.; graduated at South Carolina College in 1839; was admitted to the bar in 1843; was elected to the State Legislature in 1844; and in 1846-47 served as a captain of volunteers in the war with Mexico. In 1852 he was elected to the House of Representatives and was reëlected in 1854. Soon after the adjournment of the Senate on May 22, 1856, two days after Senator Sumner had delivered his speech on "The Crime against Kansas," in which he had spoken with great severity of South Carolina and of Senator Butler, from that State (then absent from the

Senate), Brooks, who was the nephew of Senator Butler, assaulted Sumner while the latter was writing alone at his desk in the Senate Chamber, repeatedly striking him on the head with a cane, knocking him senseless, and inflicting spinal injuries from which he never fully recovered. The House of Representatives immediately appointed a committee to investigate the affair, and the committee reported in favor of expelling Brooks, but the necessary two-thirds vote could not be secured for the motion. Brooks resigned voluntarily, however, after making a speech in justification of his act, but he was immediately reelected by his constituents. Some remarks of Representative Anson Burlingame, on June 21, charging Brooks with cowardice and a lack of fair play, provoked a challenge from the latter, and a duel was arranged to take place in Canada, near Niagara Falls; but Brooks declined to fight at the place designated, for the reason that he could not reach it "without running the gauntlet of mobs and assassins, prisons and penitentiaries, bailiffs and constables." The assault caused the greatest excitement all over the country. The North was fiercely indignant, while the South, for the most part, upheld Brooks, in some sections resolutions being passed in his honor.

BROOKS, WILLIAM KEITH (1848-1908). An American zoölogist, born in Cleveland, Ohio, March 25, 1848. He took his baccalaureate degree at Williams College in 1870 and his degree of doctor of philosophy at Harvard in 1875. He was assistant in the Boston Society of Natural History in 1875-76, associate in Johns Hopkins University in 1876, and was professor there after 1883. He trained many of the prominent embryologists of the country. His work was characterized by its relation to evolutionary problems. He published *Hand-Book of Invertebrate Zoölogy* (1882); *Heredité* (1884); *The Development and Protection of the Oyster in Maryland* (1884); *Lucifer: A Study in Morphology* (1881); *The Stomatopoda of H. M. S. Challenger* (1886); *A Monograph of the Genus Salpa* (1893); *Foundations of Zoölogy* (1898); Jordan, *Leading American Men of Science* (New York, 1910).

BROOKS, WILLIAM ROBERT (1844-1921). An American astronomer, born in Maidstone, Kent, England. He received an academic education, became an expert mechanical draughtsman, and in 1881, with a telescope of his own make, discovered his first comet. In 1874 he established, at Phelps, N. Y., the Red House Observatory, where he continued his astronomic studies, and in 1888 was called to Geneva, N. Y., there to take charge of the Smith Observatory. He became known largely through his discovery of comets, 26 being the number with which he is accredited. A frequent lecturer on astronomical topics, he has also given much time to photography of the heavens. He was, in 1887, elected a fellow of the Royal Astronomical Society of Great Britain.

BROOKS, WILLIAM THOMAS HARBAUGH (1821-70). An American soldier, born in New Lisbon, Ohio. He graduated in 1841 at the United States Military Academy; served in the Third Infantry during the Florida War, and on garrison duty at Fort Leavenworth, Kans., in 1843-44. During the Mexican War he fought at Palo Alto, Resaca de la Palma, and Monterey, and was brevetted major for his services. Subsequently he was on frontier duty in New Mex-

ico and Texas. Shortly after the outbreak of the Civil War he was appointed brigadier general of volunteers and was conspicuous in the Virginia Peninsular, Maryland, and Rappahannock campaigns. In 1863-64 he commanded the Department of the Monongahela, and in the latter year the Tenth Army Corps in the army operating against Richmond, Va. He resigned with the rank of major (Eighteenth Infantry).

BROOKS'S, brók'sez. A Whig club founded in London (1764) by the dukes of Portland and Roxborough. Its place of meeting was originally a sporting house, the first proprietor of which was Almack and the second Brooks. Its present headquarters are 60 St. James's Street, and it continues to preserve its political nature.

BROOKVILLE. A town and the county seat of Franklin Co., Ind., about 65 miles east by south of Indianapolis, on the White Water River, and on the Cleveland, Cincinnati, Chicago, and St. Louis Railroad (Map: Indiana, E 3). It has good water power, furniture factories, saw, paper, and flour mills, and contains a Carnegie library. The water works are owned by the town. Pop., 1890, 2028; 1900, 2037; 1910, 2169.

BROOKVILLE. A borough and the county seat of Jefferson Co., Pa., 100 miles by rail northeast of Pittsburgh, at the confluence of Red Bank Creek with other streams, and on the Pennsylvania, the Pittsburgh, Shawmut, and Northern, and the New York Central railroads (Map: Pennsylvania, C 4). It contains the Brookville Memorial Home for sailors' and soldiers' widows, has foundries, breweries, flour mills, and manufactures glass, various lumber products, automobiles, brick and tile, and furniture. The water works are owned by the borough. Pop., 1900, 2472; 1910, 3003.

BROOM (AS. *brōm*, Dutch *brem*, OHG. *brāmo*; cf. *bramble*). A name given to a number of species of shrubs of the closely allied genera *Cytisus*, *Genista*, and *Spartium*, all belonging to the family Leguminosæ, and all of them having long, slender branches, along which are produced axillary flowers. Common broom, *Cytisus scoparius*, is a well-known native of Europe, introduced into the United States, growing in dry soils, and in May and June ornamenting hedge banks, hills, and bushy places with its large yellow flowers, which are on short stalks, drooping, solitary, but produced in considerable number along the straight, slender branchlets. The whole aspect of the plant is graceful. The lower leaves have three oblong leaflets; the upper ones, which are reduced to bracts, are simple. The branches are angular and of a very dark green; very tough and much in use for making besoms (brushes of twigs). The leaves have been used for tanning and dyeing, and their fibre has been woven into a coarse, strong cloth and even made into paper. The whole plant is very bitter, with a peculiar nauseous taste and smell when bruised. The young tops and seeds are used in medicine, being powerfully diuretic, and very beneficial in some kinds of dropsy. They are also mildly laxative and, in large doses, emetic. They are commonly administered in the form of a decoction. Broom varies in size from a very humble shrub to one of 20 feet in height, and when it reaches this size the wood is of great value for the finer purposes of cabinetmakers and turners. Irish broom (*Cytisus patens*), not unfrequent as an ornamental plant in British shrubberies, is not

at all a native of Ireland, but of Spain and Portugal. Some species of *Cytisus* are valued for the fodder yielded by the young, tender twigs. All of them are excellent bee plants. Portugal broom or white broom (*Cytisus albus*), a native of the countries bordering on the Mediterranean, is very often planted as an ornamental shrub and is much admired for the beauty of its fascicled white flowers, which are produced upon long filiform branches. It sometimes attains a height of 15 or 20 feet. *Cytisus proliferus albus* is an important fodder plant for dry regions. It is a native of Madeira and generally goes under the name Tagosasti (q.v.). Spanish broom (*Spartium junceum*) is a native of the south of Europe, generally growing in dry soils and rocky situations, and attaining a height of 8 feet or upward. Its branches are upright, round, and rushlike, a characteristic of this genus. They are smooth and bear only a few small, simple leaves, which soon drop off. The fibre of the branchlets is much used in some parts of Italy, France, and Spain for making cloth, ropes, etc. In Spain a fine lace that is much prized is made from the fibre of this plant. In the south of France the plant is cultivated on dry, unproductive soils. The branchlets are made into bundles, dried, beaten, steeped, and washed, in order to separate the fibre. The plant possesses medical properties similar to those of the common broom. A white-flowered species, once called *Spartium monospermum*, but now called *Genista monosperma*, occasionally to be seen in shrubberies, grows abundantly on the loose sands of the coasts of Spain and produces a similar fibre. It is mentioned by Barth as growing in great abundance in Africa to the south of the great desert. Many species somewhat resembling these are occasionally to be seen among ornamental plants, some of them often in greenhouses. The Canary Isles produce some remarkable for the fragrance of their flowers. The name "broom" is not given to those species of *Cytisus* (q.v.) and *Genista* (q.v.) which do not display in a marked degree the character of having long, slender twigs. Butcher's broom is a plant of an entirely different family. See Plate of CYPRESS, ETC.

BROOM. See BRUSH AND BROOM.

BROOM, ROBERT (1866–). A South African morphologist and paleontologist, born in Paisley, Scotland. He was educated at the University of Glasgow, from which he received the degrees of M.D. (1895) and D.Sc. (1905). Cape University made him an honorary D.Sc. in 1912. In 1903–10 he was professor of zoölogy and geology at Victoria College, Stellenbosch, South Africa, and subsequently he became keeper of vertebrate paleontology at the South African Museum, Cape Town. In 1913 he was selected by the Royal Society to deliver the Croonian Lecture in London on "The Origin of Mammals." Among hundreds of articles contributed by him to scientific journals, the most important are: "Fossil Reptiles of South Africa" in *Science in South Africa* (1905); "Reptiles of Karroo Formation" in *Geology of Cape Colony* (1909); "Development and Morphology of the Marsupial Shoulder Girdle" in *Transactions of the Royal Society of Edinburgh* (1899); "Comparison of Permian Reptiles of North America with Those of South Africa" in *Bulletin of the American Museum of Natural History* (1910); "Structure of Skull in Cynodont Reptiles" in *Proceedings of the Zoölogical Society* (1911). Dr. Broom

has described over 50 genera and 100 species of fossil reptiles and amphibians, and he is one of the contributors to the present (2d) edition of the NEW INTERNATIONAL ENCYCLOPÆDIA.

BROOM CORN. A plant of the order Gramineæ, generally regarded as a native of the East Indies and cultivated for the manufacture of brooms and whisk brushes from the open, long-rayed panicles. It is one of the cultivated forms of *Andropogon sorghum*, which also includes doura, kafir corn, common sorghum, and other similar plants. The chief difference between this and other varieties of the species consists in the greater length, strength, and straightness of the fine stems composing the panicle. The plant has a jointed stem and bears clusters of two and three spikelets on the ramifications of an open panicle. In the standard varieties the stem grows 10 to 15 feet high and in the dwarf varieties from 4 to 6 feet. Conditions of soil and climate suitable for maize are also adapted to this plant. The greater portion of the annual production in the United States is furnished by Illinois, Kansas, Missouri, and Oklahoma, but it is grown in a number of other States. It is planted in hills about 18 inches apart in rows from 3 to 4 feet apart. A yield of 500 pounds of the brush or material for brooms is considered an average crop. When the panicle is nearly full-grown, the stalks are broken over at a point 12 to 18 inches below the head. This position of the panicle tends to keep the brush straight. The heads are harvested before the seed is fully ripe and while the brush is still green. They are cut off with 6 inches of the stalk, the seed is then removed by hand or machine, and the brush is cured in the shade to preserve its color and strength. The brush is pressed into bales weighing about 300 pounds. The United States exports broom corn to different countries. The broom corn produced in southern Europe is inferior in quality. As a forage crop broom corn is not very important. For illustration, see BRAZILNUT, Plate. Consult: United States Department of Agriculture, *Farmers' Bulletin* 174. See ANDROPOGON.

BROOME, SIR FREDERICK NAPIER (1842–96). A British administrator and author. He was born in Canada, was educated in England, and in 1857–69 was a sheep farmer in New Zealand. He was Colonial Secretary for Natal (1875) and for Mauritius (1878), Lieutenant Governor of Mauritius (1880), Governor of Western Australia (1882), and Governor of Trinidad (1891). In Western Australia he promoted the construction of railroads and telegraphs, and in 1890 obtained the colony's constitution. He wrote for the *Times*, the *Cornhill*, and *Macmillan's* and published *Poems from New Zealand* (1868) and *The Stranger of Seriphos* (1869), a dramatic poem.

BROOME, WILLIAM (1689–1745). An English writer. He was educated at Cambridge, took holy orders, and married (1716) a wealthy widow. He is known as a coadjutor of Pope in translating the *Odyssey*. For writing the notes and translating eight books (2, 6, 8, 11, 12, 16, 18, 23), he received £570 (out of Pope's £4500), a price which he considered too small. Comments on this transaction induced Pope to revile Broome in the *Dunciad*. After 1730 Pope and he were friends again. Broome published *Poems on Several Occasions* and translated some of Anacreon. With others he had translated (1712) the *Iliad* from Madame Dacier's French. Consult

Elwin and Courthope, *Pope's Correspondence* (London, 1871-89), especially vol. viii.

BROOM MOSS. See Plate of MOSSES AND LICHENS accompanying MUSCI.

BROOM RAPE (version of *ML. rapum genista*, broom knob or tuber, from *rapum*, knob or lump formed by the roots of trees, and *genista*, gen. sing. of *genista*, broom), *Orobancha ramosa*. An annual plant, 6 to 15 inches high, with many slender stems of a brownish or straw color, growing parasitically upon the roots of hemp and tobacco. The leaves of the plant are reduced to brown scales, and the light-blue flowers are scattered along the stalks. The broom rape is a native of Europe and has become established in some parts of the United States. The plant fastens upon the roots of the tobacco or hemp and sucks from them its nourishment, eventually killing the host it lives upon. Its seeds are minute and very abundant, and from the difficulty of its eradication especial attention should be given to the use of absolutely clean hemp and tobacco seed in planting. The small broom rape, *Orobancha minor*, attacks clover and alfalfa. For illustration, see Plate of PARASITIC PLANTS.

BROOM SEDGE. See ANDROPOGON.

BROSÖLL, brös'hël, JOHAN CARL CHRISTIAN (1816-1900). A popular and productive Danish writer, whose pseudonym was Carit Etler. He was born in Fridericia, and studied painting at the Academy of Copenhagen, but took up literature as a means of livelihood. His works include novels, sketches of travel, and dramas, which, though showing a brilliant imagination, are not always carefully worked out. His *Skrifter* ('Collected Writings') appeared in Copenhagen in 1859-68 (24 vols.), to which was added a *Ny Samling* ('New Collection') in 1873-79 (5 vols.).

BROSIG, brö'zik, MORITZ (1815-87). A German organist and composer, born in Fuchswinkel, Silesia. He studied in Breslau under Franz Wolf and in 1842 succeeded him as organist of the Breslau Cathedral. In 1852 he was appointed kapellmeister at the cathedral and in 1871 lecturer on music at the University of Breslau. He published a textbook of harmony, and valuable church music, including seven masses with orchestra, and many graduals and offertories.

BROSSE, brös, SALOMON DE, wrongly called JACQUES (c.1560-1626). A prominent Huguenot architect of the late French Renaissance, a relative and follower of Androuet du Cerceau. His fame rests largely on the Luxembourg Palace (q.v.), in Paris, which he built for Marie de' Medici (1615-20); but he was also the author of other works of great merit. Among these are the Medici fountain in the Luxembourg gardens, the dignified Italian façade of the church of St. Gervais-St. Protais, and the great hall (Salle des Pas-Perdus) of the Palais de Justice, all in Paris. Consult Pannier, *Un architecte français au commencement du XVII^e siècle: Salomon de Brosse* (Paris, 1911).

BROSSES, brös, CHARLES DE (1709-77). A French historian. His first work was *Lettres sur l'état actuel de la ville souterraine d'Herculanée* (1750), the result of a tour through Italy in 1739. At the suggestion of his friend Buffon, the naturalist, he wrote the *Histoire des navigations aux terres australes* (2 vols., 1756), in which he described the supposed great southern continent under the several names of Magellania,

Australia, and Polynesia. The last two of these names were first employed by him. His next work was *Du culte des dieux fétiches* (1760). It was followed by a *Traité de la formation mécanique des langues* (2 vols., 1765), which, in spite of many errors, contains many ingenious observations and conjectures. He contributed articles on language to the famous *Encyclopédie* of Diderot, Voltaire, and others. During the greater part of his life he was busily engaged in supplying the lacunæ in the works of Sallust; and having collected about 700 fragments by this historian, he published, with such interpolations as he deemed necessary, the *Histoire de la République romaine dans le cours du septième siècle, par Salluste* (1777). Many of his manuscripts were published after his death, and a complete edition of his works in 52 volumes has been issued (1878-85).

BROT (AS. *broth*, OHG. *brod*, *brōt*, Gael. *brōt*, Ir. *broth*, from the root of *bren*, AS. *brēwan*, OHG. *briuan*, Ger. *brauen*). A liquid preparation of animal food, which differs from soup in that it contains no vegetables. The usual broths are made of beef, mutton, or chicken, and are much used as food for invalids. The following are the recipes for the production of broths, taken from Curran's *Sickness and Accidents* (Chicago, 1894). *Beef Broth* (time, 1 hour).—One pound of lean, juicy beef, one pint of cold water, half teaspoonful of salt. Mince the meat, put it in a stewpan with the water and salt and boil slowly one hour, strain and add a little black pepper, if allowed, and serve hot with strips of dry toast. *Mutton Broth* (time, 2 hours).—Two pounds of lean, juicy mutton, one quart of cold water, one teaspoonful of salt. Remove all fat and skin, cut up the meat, put it in a stewpan with the water and salt, and boil slowly an hour and a half. Strain, and set away to cool. When cold, remove all fat and dregs, and heat a portion as required for use. *Chicken Broth* (time, 2 hours).—Three pounds of tender chicken, two quarts of cold water, two scant teaspoonfuls of salt. Skin the chicken (if it is very fat), cut it up, pound the pieces with a mallet until the bones are broken. Put it in a stewpan with the water and salt, and boil slowly two hours; strain, and set aside to cool; when cold, remove all fat and dregs, and heat as required for use.

There is very little nutrition in broths, as stated in the article MEAT EXTRACT. They contain mainly gelatin, salts, fat, and extractives; these, however, are easily assimilated food upon which a convalescing patient may rely in part, as a change of diet for a feeble stomach.

BROTTEL, brōt'el (for ME., OF. *bordel*, ML. *bordellum*, little hut, brothel, dim. of *borda*, hut, from Teut. *borā*, Eng. *board*, plank). Another name for bawdy house, a house of ill fame or house of prostitution, i.e., a "house kept for the resort and convenience of lewd people of both sexes." The keeping of such a house was a misdemeanor at common law, as it still is under modern statutes, being classed as a "public nuisance."

Prostitution is not, of itself, a common-law offense, and a house is not necessarily a brothel because a prostitute lives there and receives men there privately for immoral purposes. On the other hand, the conduct of persons maintaining and resorting to a place of prostitution need not be so shameless, noisy, or disorderly as to be noticeable from the outside, in order to make

the place a brothel. Usually, however, to have that character it must be a place of resort for persons of both sexes for immoral purposes or there must be several women, perhaps under a common management, to whom men resort in considerable numbers. By modern statutes in this country as well as in England the liability for keeping a brothel has been extended to the lessees or landlords of any premises to them known to be used for that purpose. Modern legislation has also dealt extensively with sexual offenses promoted by brothels. See ADULTERY; CONSENT; AGE; PROCURER; PROSTITUTION; WHITE SLAVERY.

BROTHERHOOD OF ANDREW AND PHILIP. A brotherhood formed in 1888 by Rev. Rufus W. Miller, associate pastor of the Second Reformed Church in Redding, Conn. It held its first Federal convention in New York City in 1893, and by 1895 it had grown into an order for religious and social service in many denominations. These include the Reformed Church in America, the Reformed Church in the United States, Congregational, Presbyterian (North, South, Canadian, and United), Methodist Episcopal, Methodist Protestant, Baptist, United Brethren, Lutheran, Reformed Episcopal, Church of Christ, Progressive Brethren, Friends, United Evangelical, Free Baptist, African Methodist Episcopal, and the Evangelical Association. The Brotherhood has chapters in Australia, Japan, China, and England. There were in the United States in 1913 1000 chapters, with a membership of about 45,000. There were also 102 boys' chapters, in which were enrolled about 2000 members. The Brotherhood holds biennial, Federal, and annual denominational conventions. The official organ is the *Brotherhood Star*. Consult Bacon and Northrop, *Young People's Societies* (New York, 1900).

BROTHERHOOD OF ST. ANDREW. A Protestant Episcopal organization, whose object is the spread of Christianity among men, especially young men. It was founded in 1883 in St. James's Parish, Chicago, by James L. Houghteling and others. The unit of organization is the local chapter. In 1913 there were 942 chapters in force, representing 864 active and 78 probationary chapters. There is also a junior department for work among boys, which has 543 active chapters. There are about 10,000 members in the Brotherhood proper, and 5000 in the junior department. The headquarters of the Brotherhood are in Boston. It holds an annual convention and publishes monthly an official organ called *St. Andrew's Cross*. It has extended to England and her colonial possessions. Consult Bacon and Northrop, *Young People's Societies* (New York, 1900).

BROTHERHOODS, RELIGIOUS. Societies instituted for pious and benevolent purposes, numerous in the Middle Ages and in the Roman Catholic church of modern times. They are instituted especially for those who wish to have the help of organization and common aims, but are not conscious of a vocation to join the strictly religious orders. In some cases they appear as affiliated societies to the latter, as in the case of the Third Order of St. Dominic and of St. Francis. (See TERTIARY.) In the Middle Ages a number of brotherhoods sprang up which either did not seek or did not obtain ecclesiastical recognition and finally assumed the character of sects with more or less of heretical tendency. To this class belonged, among others, the Beg-

hards and Beguines (q.v.), the Apostolic Brethren (q.v.), and the Flagellants (q.v.), who while tolerated by the Church for a while, at last incurred its censure and were severely repressed. Other confraternities which came into existence with the sanction of the Church devoted themselves to the promotion of religion and, under its direct influence, to the performance of many practical works of charity, by assisting strangers, travelers, the unprotected, the oppressed, the destitute, and the sick. Typical examples of these mediæval brotherhoods are the Bridge-building Brotherhoods (q.v.), and especially the *Fratelli della Misericordia* at Florence, still existing, whose work it is to bury the dead, and under whose picturesque costume are frequently concealed the features of members of the noblest Italian houses.

The last two centuries have witnessed the growth of a great number of Roman Catholic confraternities, both for men and women, based on the same principle as these earlier ones. Many of them are more or less associated with the religious orders; thus the League of the Sacred Heart or Apostleship of Prayer, with millions of members all over the world, under the direction of the Jesuits; the Rosary sodalities, of the Dominicans; and the confraternities of the Scapular, of the Carmelites. Consult Leete, *Christian Brotherhoods* (Cincinnati, 1912).

BROTHER JON'ATHAN. The name of the best-known personification of the United States, the origin of which is doubtful. The most plausible explanation derives it from Jonathan Trumbull (q.v.), Governor of Connecticut during the Revolution, and a highly esteemed friend of General Washington, who, it is said, was accustomed to remark when perplexed by some knotty question, "We must consult Brother Jonathan." From its frequent repetition the term became widely known, and ultimately expanded in meaning to embrace the whole American people.

BROTHERS, LAY. An inferior class of monks, not in holy orders, but bound by monastic rules and employed as servants in monasteries (q.v.).

BROTHERS, THE. A club founded, June 21, 1711, in London, for the purpose of advancing literature by sociability and the use of political influence. Besides several Tory peers, St. John, Swift, Prior, Friend, and Arbuthnot were among its charter members. It became, in 1714, the *Scriblerus Club*, a more purely literary and less political organization, under the influence of Swift. The members addressed each other as "brother."

BROTHERS, THE. 1. A comedy by James Shirley, licensed Nov. 4, 1626, and printed in a volume entitled *Six New Plays* by the same author, in 1653. 2. A tragedy by Edward Young, produced at the Drury Lane, March 3, 1752, for the benefit of a religious society. It was not very successful, running for eight nights and clearing only £400. It was written during the author's early life and for a long time suppressed as inimical to his profession of clergyman. 3. A play by Richard Cumberland, brought out at Covent Garden in 1769. It was the first real comedy of the author and gained for him the friendship of Garrick by the flattery of the prologue.

BROTHERS, RICHARD (1757-1824). A religious fanatic. He was born at Placentia, New-

foundland, Dec. 25, 1757, and was at one time a lieutenant in the British navy, which he quitted on half pay in 1783, believing that a military life was inconsistent with a Christian profession. Having scruples against taking the oath requisite to enable him to receive his half pay, he was reduced to great distress, and ultimately placed in the workhouse for a brief period. He regained his liberty in 1792. Dating his first call from 1790, he announced himself, in 1793, the apostle of a new religion, "the nephew of the Almighty, and Prince of the Hebrews, appointed to lead them to the land of Canaan." In 1794 he published a book, entitled *A Revealed Knowledge of the Prophecies and Times, etc.*; and, in 1795, an exposition of the Trinity. He was the author of several other publications marked by a strange mixture of reason and insanity, which made a temporary sensation. In consequence of prophesying the death of the King and the destruction of the monarchy, he was committed to Newgate, but soon liberated. Some of his political predictions, especially in reference to the state of the Continent, were either altogether or partially fulfilled; and many persons were induced to sell their goods and prepare to accompany him to his New Jerusalem, which was to be built on both sides of the river Jordan. Even men of ability and education were deluded into believing in him, two of the most eminent being Halhed, the Orientalist, and William Sharp, the celebrated engraver. As a dangerous lunatic, he was at length committed to a private asylum, but released in 1806, and died in London, Jan. 25, 1824.

BROTHERS and SISTERS OF CHARITY.

Under these names there exist in the Roman Catholic church widely ramified beneficent societies for the nursing of the poor and sick in hospitals, without distinction of faith, rank, or nation. The Order of the Brothers of Charity, or Compassionate Brothers, was established in 1540 at Seville, in Spain, by the Portuguese João de Dio (died 1550), who had served in Africa under Charles V. The funds for the purpose were obtained by begging. The primitive object of the society was the care of the sick and the reformation of women of immoral character; it was composed of lay members, under no rule. In the year 1572 the order received the papal recognition and was subjected to the rule of St. Augustine. All the privileges of the mendicant orders were conceded to it in the year 1624, and it was then divided into a Spanish congregation, with a major general in Granada, and an Italian or extra-Spanish congregation, with a major general in Rome. The political disturbances of the nineteenth century abolished the Spanish as a separate province; the whole order is now governed by a general who resides in Rome. It has at the present time over 1000 members, who bind themselves, besides the usual three vows, by a fourth which requires them to devote their whole lives to the care of the sick and infirm. Their services to distressed humanity continue to be held in high estimation. Another order is the Congregation of the Brothers of Charity, founded in Belgium and approved by the Pope in 1809. They are devoted to the assistance of the poor, the aged, and various classes of the helpless. They have over 40 communities in Belgium, with about 1000 members, and have spread to many other countries. In 1865 they entered America at

Montreal, whence they have spread through Canada, and have also a house in Boston. There are, in the Roman Catholic church, several orders of female celibates devoted to the care of sick and of children, who are called "Sisters of Charity." The best known are the "Sisters of Charity of St. Vincent de Paul," known in France as the "Gray Sisters," from their dress. They were first called into existence in France in 1631, by St. Vincent de Paul (born 1576), greatly assisted by the noble-hearted and self-devoted widow, Madame Louise (de Marillac) Le Gras. The Archbishop of Paris raised the society into an order, "The Daughters of Divine Love," and its rule was confirmed by Pope Clement IX in 1668. In 1789 it already numbered 426 convents in France, besides a few in Switzerland and Spain. The French Revolution sorely interrupted the abundant and benevolent labors of the Sisters of Charity by the suppression and proscription of their convents in France; but Napoleon restored the order in 1807 by the convocation of a general chapter of the scattered sisters, under the presidency of the Empress mother and by the grant of the necessary funds. The Sisters of Charity of St. Vincent de Paul were introduced into the United States by Elizabeth Ann Seton, at Emmitsburg, Md., in 1809. At first the American Sisters' rule was a frank adaptation of the French, but they were independent; but since 1850 they have been united to the French body. In 1846 the New York branch (opened 1817) was made a separate community with 33 members. The present mother house is at Mount-Saint-Vincent-on-Hudson, which in 1910 became the College of Mt. St. Vincent. Its 1440 sisters (1914) have under their care 26 academies and high schools, 94 parochial schools, including 11 outside of the New York diocese, besides various charitable institutions. See SISTERHOODS.

BROTHERS AND SISTERS OF THE FREE SPIRIT. A sect which sprang up along the Rhine toward the beginning of the thirteenth century and afterward spread into France and Italy. It based its peculiar tenets on the scriptural doctrine that "where the Spirit of the Lord is, there is liberty." Misconceiving the true nature of spiritual freedom, the members of this sect conceived themselves released not only from ecclesiastical discipline, but also from the commonest obligations of morality. They set aside the marriage tie and indulged in licentiousness. A few even maintained the old Manichean doctrine that the deeds of the body could not possibly affect the soul. Intellectually they are said to have been inclined to Pantheism under the teachings of Amalric of Bene (q.v.). The synods of Cologne in 1306 and of Treves in 1310 decreed their suppression, and in the persecutions which followed they seem to have been completely dispersed, although a few traces of their influence could be found as late as the sixteenth century, for example, among the so-called Libertines of Geneva.

BROTHERS OF COMMON LIFE (also called **BROTHERS OF GOOD WILL**, and **HIERONYMITES**, or **GREGORIANS**, from their patron saints, Jerome and Gregory the Great). A fraternity founded at Deventer about 1376 by Gerhard Groote (q.v.), whose successor was Florentius Radewin (born 1350, at Leerdam in Holland; died 1400). Thomas à Kempis, who was associated with Radewin, wrote the lives of both these founders. The society grew very rapidly,

and under Gerhard's instructions helped to found several houses of Canons Regular of St. Augustine with which it was allied. But the original society, which professed to be a copy of the earliest Christian communities, was composed of persons who desired to live a devout and ascetic life in community without formal vows. Community of goods, industry, care for the education of the young, and a tendency to promote reading of the Scriptures and public prayers in the vernacular, are among their characteristics. Despite the opposition of some of the older communities, they were recognized by several Popes and by the Council of Constance (1414-18). They became most numerous in the Netherlands and Germany, nearly every large town having one or more of their houses, but spread also to Italy and Portugal, so that by 1430 they reckoned more than 130 societies. The last was founded at Cambrai in 1505. They seem to have decayed after the outbreak of the Reformation, which carried to more extreme lengths what had been distinctive principles of theirs. A number of the brothers joined the reforming movement. Some of their educational institutions were taken over by the Jesuits. The most distinguished members of the society were Thomas à Kempis (q.v.), Gerhard Zerbold of Zutphen, and the learned Cardinal Nicholas Cusa. Consult Kettlewell, *Thomas à Kempis and the Brothers of Common Life* (London, 1884).

BROTHERS OF THE CHRISTIAN SCHOOLS. An order, commonly called Christian Brothers, established by St. Jean Baptiste de la Salle at Rheims in 1684 and sanctioned by Pope Benedict XIII in 1725, having for its object the furnishing of the poor with instruction.

The brothers take the three vows of religion, poverty, chastity, and obedience, but do not enter holy orders. By preference, they take charge of elementary schools, but also devote themselves to higher educational work in colleges and in technical and professional schools. They maintain institutions in most countries of Europe as well as in the United States, Canada, India, Egypt, South Africa, and Australia. In 1905 the brotherhood had 14,000 members, mostly resident in Europe. In the United States the brothers conduct parochial schools, normal institutes, and colleges, with a teaching staff of 1200. When religious teaching orders were suppressed in France in 1904, the brothers' schools were closed and their property confiscated by the government, but they established other schools near the borders of France, in which they tried to carry on part of their French work. See LA SALLE, JEAN BAPTISTE DE.

BROTTON. See SKELTON and BROTON.

BROUCKÈRE, broók'kär', CHARLES MARIE JOSEPH GHISLAIN DE (1796-1860). A Belgian statesman, born in Bruges. He entered the artillery service and fought at Waterloo. In 1826 he was elected deputy to the States-General from the province of Limburg. Here he was a prominent advocate of Belgian independence. He was Minister of Finance for the Provisional Government, and after the establishment of the representative monarchy was appointed by Leopold I Minister of the Interior (1831) and soon afterward Minister of War. He reorganized the army, but was attacked on the ground of extravagant expenditures, and resigned (1832). He was subsequently director of the mint, a professor in the free University of Brussels, and burgomaster of that city. He is author of

Principes généraux d'économie politique (1851). Consult the *Life* by Juste (Brussels, 1868).

BROUCKÈRE, HENRI MARIE JOSEPH GHISLAIN DE (1801-91). A Belgian statesman, born in Brügge. He became an advocate, was elected to the National Congress, and represented Brussels in the Chamber of Deputies from 1833 to 1848. In 1840 he became Governor of Antwerp, in 1844 of Liège, and from 1849 to 1852 was Belgian Minister at the papal and other Italian courts. He was Minister of Foreign Affairs in the so-called "Ministry of Conciliation," formed after the overthrow of the Liberals, and in that capacity did much to restore friendly relations between Belgium and France. At one time he was also councillor of the Brussels Court of Appeals and in 1855-70 represented Mons as a Liberal deputy.

BROUGH, bruf, FANNY (1854-1914). An English actress, niece of Lionel Brough (q.v.). She made her début in Manchester in 1869, when quite young, and appeared in London in 1870, as Fernande, at the St. James's Theatre. For a time she became a leading member of the *Caste* company and otherwise has also toured extensively in the provinces. Among her London engagements have been those in *Harvest* (Princess's Theatre, 1886); *Civil War* (with Mrs. Brown Potter at the Gaiety Theatre, 1887); *Little Lord Fauntleroy* (Terry's, 1888); *Dr. Bill* (Avenue, 1890); *The Henrietta* (ib., 1891); *Mrs. Othello* (Toole's Theatre, 1893); *The Eider-down Quilt* (1896). She has also played in the United States, where, in 1900, she appeared as Mrs. Reginald Mainwaring, Sr., in the production of *My Daughter-in-Law* (Lyceum, New York). In 1901 she appeared in the private performance of *Mrs. Warren's Profession* at the New Lyric Club. Of late years she has been much interested in the movement to improve the conditions of life for actresses.

BROUGH, JOHN (1811-65). A famous Governor of Ohio. He was born in Ohio and, as a printer's apprentice, earned his way through the State University. He published several Democratic journals, held minor political posts, and was regarded as the ablest speaker of his party in the State. In 1864 he was nominated for the Governorship of Ohio by the Republican Union party, and was elected over Clement L. Vallandigham (q.v.) by the largest majority ever given for a governor up to that time. As a governor he was remarkably efficient, and though holding office only during a part of the Civil War period, is generally called "the war Governor" of Ohio. Consult O. C. Hooper, "John Brough" in *Ohio Archaeological and Historical Society Publications*, vol. xiii (1904), and E. Erwin, "Birthplace of John Brough," ib., vol. xvii (1908).

BROUGH, LIONEL (1836-1909). An English comedian, born at Pontypool, Monmouthshire. He was a son of Barnabas Brough, a dramatic author, and a brother of William and Robert, the "Brothers Brough." In his early life he was a journalist, beginning in a subordinate position in the service of the *Illustrated London News*, and being afterward on the *Daily Telegraph*, of which he published the first issue. He made his first appearance on the stage in 1854, at the Lyceum, in *Prince Pretty Pet*, and continued his connection with the theatre for four years. In 1858 he accepted a position on the staff of the *Morning Star*, which he held for five years. He next gave "ghost entertainments" at the Poly-

technic Institution and in the provinces. His acting created such a favorable impression that in 1864 he was given a regular engagement at the Prince of Wales Theatre, Liverpool, and thereafter devoted himself permanently to the drama. In his long subsequent experience, which has included tours in the United States and South Africa, he has gained popularity in a great variety of comic and burlesque rôles, one of the best known being that of Tony Lumpkin in *She Stoops to Conquer*, which he has played nearly 800 times. Among his other favorite parts have been those of Paul Pry, Capt. John Smith in *La belle sauvage*, and Black Brandon in *My Poll* and *My Partner Joe*. In 1872 he was stage manager of the huge spectacular production of *Babil and Bijou*, at the Covent Garden Theatre. More recently he was for several years under the management of Beerbohm Tree, of the Haymarket and Her Majesty's theatres, appearing as the Laird in *Trilby* (1895) and in other of Mr. Tree's plays, both in England and America. In 1901 he was at the Haymarket in *Sweet Nell of Old Drury* and in 1906 at Drury Lane in *The Bondman*.

BROUGHAM. See **CARRIAGE.**

BROUGHAM, broo'am or broöm, HENRY PETER, BARON BROUGHAM AND VAUX (1778-1868). A British jurist, orator, statesman, and scientist, descendant of an ancient Westmoreland family. He was born in Edinburgh, Sept. 19, 1778. On the maternal side he was a grand-nephew of the historian Robertson. He exhibited signs of precocious talent and energy and at an early age was compared to the "admirable Crichton." He was a brilliant scholar, both at the Edinburgh High School and at the university, at the age of 17 sending a paper, *Observations on Phenomena of Light*, to the Royal Society, which was read and printed in its *Transactions*. He spent some time in traveling on the Continent and in 1800 was admitted to the Scottish bar. In 1802, with Jeffrey, Horner, and Sydney Smith, he founded the *Edinburgh Review* and contributed 80 of its most powerful articles to the first 20 numbers. His liberal political views militated against his advancement in Scotland, and a reputation for eccentricity and indiscretion excluded him from any legal practice except the unremunerative work of the criminal courts. After seven years of this practice he sought a better field and in 1808 passed at the English bar.

In London Brougham first attracted notice at the bar of the House of Commons as counsel for the Liverpool merchants who petitioned against certain orders-in-council. In 1810 he entered Parliament and soon after brought in and carried an act making participation in the slave trade felony. He was welcomed by the Opposition leaders as a powerful assistant in their attacks upon the government. He succeeded in carrying the repeal of the orders-in-council shortly before the general election of 1812 and contested the membership for Liverpool against Canning. He was defeated, and remained without a seat in Parliament till 1816, when he was returned for Winchelsea. He established a reputation in the law courts by speeches of great ability in the defense of persons prosecuted for libel by the crown. His most famous appearance as an advocate was in defense of Queen Caroline in 1820. His eloquence and boldness forfeited him the favor of the crown, but gained him that of the people, and between 1820 and 1830 Brougham

was the popular idol. He made good use of his power. In 1822 he supported, though in vain, a scheme of national education, and to his activity was due in great measure the establishment of the London University, of the first Mechanics' Institute, and of the Society for the Diffusion of Useful Knowledge. In 1830 Brougham delivered a powerful speech against slavery, and in consequence of it was returned as a member for York. The aristocratically disposed Whigs would have excluded him from the Reform ministry of Earl Grey; but, in addition to enormous popularity, he was virtually their leader in debate in the Commons and was indispensable. The same year, after various intrigues, he was offered the appointment of Lord Chancellor and a peerage as Baron Brougham and Vaux, which he accepted against his interests and inclinations. He assisted materially in carrying the great measures proposed by the Liberal ministers. He, however, developed eccentricity and by arrogance and self-importance shared in the general unpopularity which afterward attached to the ministry. When it was dismissed by William IV in 1834, Brougham left office, never to return. After that time he held in the Upper House a position analogous to that formerly held by him in the Commons, criticising freely the conduct of successive administrations, but steadily forwarding every measure for social progress.

He is best remembered as a law reformer. In 1827, in a memorable speech which occupied six hours in delivery, he enumerated the defects in nearly every branch of English law and made proposals for dealing with law reform on a proper scale. Among the measures proposed were bills for the codification of the criminal law, for the establishment in England of a system of public prosecutors, and for the giving of compensation to parties acquitted. Lord Brougham's acts and bills touching on law reform, as well as those regarding the slave trade, education, and other public questions, were collected and published by Sir J. E. Eardly-Wilmot (London, 1857). The volume forms a fitting monument to the activity, perseverance, and public spirit of the man.

As an orator and parliamentary debater, among his contemporaries he was inferior only to Canning. His speeches, however, had too large an admixture of exciting elements; argument was mingled with fiery declamation; ridicule, sarcasm, invective, were freely used; and these he employed with a vehemence and energy that at times carried him beyond bounds. He possessed the power of ready, rapid, and forcible diction. Brougham also won repute in other fields. He cultivated the mathematical and physical sciences and ventured upon the domain of metaphysics and even of theology. His miscellaneous writings upon an incredible variety of subjects served the purposes of the moment and display great powers of rapid comprehension and nervous, clear exposition, but contain few new truths in politics or morals and no original discoveries in science. Brougham acquired the honors due to men of letters and was successively made lord rector of Glasgow University, president of University College, London, member of the Institute of France, chancellor of the University of Edinburgh, and lastly, D.C.L. of Oxford.

During and subsequent to his chancellorship his public appearances in a little carriage

specially built for him excited curiosity. This vehicle became associated with his name and was the forerunner of the modern "brougham." When not engaged in Parliament, Lord Brougham resided chiefly at Cannes, in the south of France. The growth and prosperity of this seaside resort is mainly due to Brougham, and he is kept in remembrance by a monument erected by the grateful inhabitants. He died there, May 7, 1868. He left a memoir of his *Life and Times* (3 vols., New York, 1871). Written in his old age, it contains exaggerated statements; while the partisan tone of his biographers is also unreliable. Consult his *Works* (11 vols., 1855-62), and Campbell, *Lives of Lord Lyndhurst and Lord Brougham* (London, 1869). Brougham's letters to James Loch, one of his early friends, were edited by R. H. M. Buddle Atkinson and G. A. Jackson and privately printed in London in 1908.

BROUGHAM, JOHN (1810-80). An Irish actor and playwright. He was born in Dublin, May 9, 1810. Educated as a surgeon, a reverse of the family fortunes led him to the London stage in 1830, where he achieved success as an actor and writer of light burlesque and collaborated with Dion Boucicault in the comedy *London Assurance*. For a time he managed the London Lyceum, but moved in 1842 to the United States, where he became a member of the stock company of Burton's Theatre, in New York, for which he wrote several now-forgotten comedies. He then undertook the management of Niblo's Garden, and in 1850 opened Brougham's Lyceum (later Wallack's Theatre), an unsuccessful venture. Then he became manager of the Old Bowery Theatre and finally accepted an engagement at Wallack's and soon after at Burton's. For all these theatres he wrote dramas of ephemeral interest, such as *Playing with Fire* and *The Game of Love*. The years of the Civil War he passed in England. Returning to New York, he made another unsuccessful attempt in theatrical management. His last appearance on the stage was at Booth's Theatre, Oct. 25, 1879, and he died June 7, 1880, in New York City. He was the founder of the New York Lotos Club and for some time its president. He also launched a short-lived comic paper, *The Lantern* (1852), and published two volumes of miscellanies, *A Basket of Chips* (1855) and *The Bunsby Papers*. In all, he wrote about 100 plays, none of them noteworthy.

BROUGHTON, brou'ton, HUGH (1549-1612). A Protestant Bible scholar. He was born at Owlbury, Shropshire, England, and educated at Cambridge. At an early age he distinguished himself as a Hebrew scholar. He was a Puritan preacher in London for a while, but deemed it prudent to retire to the Continent in 1589, because the bishops thought his views dangerous. Henceforth he went back and forth and from 1603 to 1611 was pastor of the English congregation at Middelburg, Holland. He died in London, Aug. 4, 1612. Though as early as 1593 he had projected a new translation of the Bible, and his fitness for the work was universally acknowledged, he was given no part in King James's Version. This was a great disappointment to him, and he criticised the version unsparingly. John Lightfoot, a still greater Hebrew scholar, edited his literary remains, with a life (London, 1662).

BROUGHTON, brou'ton, JOHN CAM HOBHOUSE, BARON (1786-1869). An English states-

man and writer, the friend of Byron. He was born near Bristol, June 27, 1786. He was educated at Westminster and at Cambridge, where, in 1808, he obtained both the Hulsean prize and his B.A. degree, graduating M.A. in 1811. In 1809 he visited Spain, Portugal, Albania, Greece, and Turkey, with Byron. In 1813 he followed the allied armies and was present at the battle of Dresden and at Paris when Louis XVIII returned in 1814. When Napoleon escaped from Elba, Hobhouse again sought Paris, and the following year published the *Hundred Days in Paris*. The work, of Napoleonic sympathies, gave great offense both in England and France. The translator and printer in Paris were sentenced to fine and imprisonment for an "atrocious libel." In 1816 he joined Byron near Geneva, and together they visited Venice and Rome. Early in 1819 he unsuccessfully contested the parliamentary borough of Westminster, but the following year he was elected by a large majority, his three months' imprisonment in Newgate for breach of privilege of the House of Commons through the publication of a political pamphlet having brought him popular sympathy. For 12 years he was an advocate of liberal measures, among them the repeal of the Test and Corporations acts and Roman Catholic emancipation. In 1831 he succeeded to his father's baronetcy, and in the same year was Secretary of War in the Grey ministry. Subsequently he was in the cabinet of Lord Melbourne and Lord John Russell as Chief Commissioner of Woods and Forests and President of the Board of Control. In 1851 he was raised to the peerage and created Baron Broughton. At his death, June 3, 1869, the title became extinct, while the baronetcy passed to his nephew. Lord Broughton published: *Imitations and Translations from the Classics* (1809); *Journey through Albania and Other Provinces of Turkey* (1812); *Historical Illustrations of the Fourth Canto of Childe Harold* (1818). As Byron's intimate friend he was dissuaded from replying to Lady Byron's *Remarks*, but wrote a manuscript, now in possession of Lady Dorchester, containing a "full and scrupulously accurate account of the separation, to be used if necessary." The British Museum has his diary, which he desired to be left unopened till 1900. Consult his *Recollections of a Long Life*, edited by his daughter Lady Dorchester (London, 1909).

BROUGHTON, PHYLLIS (?-1926). An English actress, who began her career as a London music-hall dancer and afterward gained popularity in light comedy. Among the plays in which she has appeared are: *The Forty Thieves* (1880); *Whittington and his Cat* (1881); *Aladdin* (1881); *Paul Jones* (1889); *Marjorie* (1890); *Blue-eyed Susan* (1892); *In Town* (1892); *Gentleman Joe* (1895).

BROUGHTON, RHODA (1840-1920). A popular English novelist. She was born in North Wales, but has spent much of her life in Oxford. Among her works, all of which are clever and entertaining, are: *Cometh up as a Flower* (1867); *Not Wisely but too Well* (1867); *Red as a Rose is She* (1870); *Nancy* (1873); *Belinda* (1883); *Doctor Cupid* (1886); *Alas!* (1890); *Scylla or Charybdis* (1895); *Dear Faustina* (1897); *Foes in Law* (1901); *Lavinia* (1902); *The Devil and the Deep Sea* (1910); *Between Two Stools* (1912).

BROUSSA, broos'a. See BRUSA.

BROUSSAIS, brō'sá', FRANÇOIS JOSEPH VICTOR (1772-1838). A French physician. He was born at Saint-Malo, France, and was educated in the Dinan Public School. He volunteered at the outbreak of the Revolution, but ill health caused his discharge from the army. He then studied medicine under his father, who was a physician, and returned to the service with a surgeon's commission, being attached first to the army and later to the navy. In 1799 he began a course of medical study in Paris. From 1804 to 1808 he was again a surgeon in the army, and from 1808 to 1814 he was chief physician of a division of the French army in Spain. In 1820 he was appointed professor at the military hospital of Val-de-Grâce, in Paris, after serving as assistant professor. In 1830 he became professor of general pathology and therapeutics in the Faculty of Medicine in Paris and afterward was made a member of the Institute. In 1841 a statue was erected to his memory in the court of Val-de-Grâce. Broussais's peculiar views are ably explained in his chief works—the *Histoire des phlegmasies ou inflammations chroniques* (1808) and *Examen de la doctrine médicale généralement adoptée* (1816)—which assert the following principles: No life is possible without excitation or irritation. As long as the excitation is evenly distributed throughout the organism and remains within certain limits of intensity, the processes of life go on in a normal physiological manner; but if the limits are exceeded, i.e., if excitation becomes either too strong or too weak, the result is a condition of disease. Disease, originally local and generally caused by local over-excitation, gradually spreads in the body by physiological sympathy and thus becomes general. The organs most subject to local over-excitement are the stomach and the intestines, and hence a great many general diseases are directly traceable to local disease of these organs. The historical importance of the theory lies in the fact that it has led to a careful study of physiological sympathies and of pathological anatomy and thus to the building up of modern medical science. Besides the works already mentioned, Broussais wrote: *Traité de la physiologie appliquée à la pathologie* (1824); *Commentaires des propositions de pathologie consignées dans l'examen* (1829); *Le choléra morbus épidémique* (1832). Consult Montègre, *Notice historique sur la vie, les travaux et les opinions de Broussais* (Paris, 1839), and Reis, *Etude sur Broussais et sur son œuvre* (Paris, 1869). See BROWN, JOHN.

BROUSSON, brō'sōn', CLAUDE (1647-98). A French Protestant martyr. His house was the rendezvous of certain Protestant leaders, and he was compelled to fly from his native city (Toulouse), barely escaping into Switzerland. He ventured into France twice afterward, at great peril, to preach and give comfort to his co-religionists. Finally, in 1698, after a great price had been set on his head, he was caught, and on the flimsy charge of treason was sentenced to be broken on the wheel. He left a large number of works, including *L'Etat des réformés de France* (3 vols., 1685); *Lettres pastorales* (1697); *Lettres et opuscules* (1701). Consult Payne, *The Evangelist of the Desert* (1853).

BROUSSONET, brō'sō'nā', PIERRE MARIE AUGUSTE (1761-1807). A French naturalist. He received his doctorate when only 18 and

visited London, where he published his *Ichthyologia Decas Prima* (1782) and was made a member of the Royal Society. He returned to Paris in 1783, taught in the College of France, reorganized the Society of Agriculture, and in 1785 was made a member of the Academy of Sciences. He was elected to the Legislative Assembly, but under the Convention was suspected of being a Girondist and fled to Spain. He was physician to an embassy which the United States sent to Morocco and afterward was French consul at Teneriffe. In 1805 he was appointed professor of botany at Montpellier. Broussonet is stated to have first introduced the Angora goat and Merino sheep into France. He published many memoirs on botany and ichthyology, including: *Ichthyologia decas prima* (1782); *Année rurale ou Calendrier* (2 vols., 1787-88); *Elenchus horti Monspeliciensis* (1805).

BROUWER, brou'ēr, or **BRAUWER**, ADRIAEN (c.1605-38). The greatest of Flemish genre painters, also a landscape painter of note. He was born at Oudenarde, and, according to a very probable tradition, was the son of a designer of tapestries, from whom he received his earliest instruction. An orphan at 16, he ran away to Antwerp, where he first studied from or under the influence of Pieter Breugel the Younger. He was present at the siege of Breda in 1625, practiced in Amsterdam in 1625-26, and in the latter year settled at Haarlem. Here he became a follower of Frans Hals. In the winter of 1631-32 he was again at Antwerp, where he was imprisoned in the citadel in 1633, probably on account of his Dutch sympathies, and afterward lived with the engraver Paulus Pontius until his death in 1638. A universal and well-founded tradition records him as a jovial and dissipated character, whose favorite resort was the tavern. This view is confirmed by the subjects of his paintings, most of which represent tavern scenes and brawls. Such a life, however, did not prevent him from becoming one of the greatest painters the Netherlands ever produced. His works were highly esteemed during his lifetime, especially by his brother artists, on account of their remarkable technical qualities. His drawing is sure, and the rapidity with which in his drawings he notes expression, movement, and space is unsurpassed in the art of his country. His color is delicate and has fine atmospheric effect; his composition is always good. He exercised a dominant influence upon the peasant genre of the Netherlands, not only in Flanders, where Teniers the Younger was one of his followers, but also in Holland upon such painters as Adriaen van Ostade and Heemskerck.

Three periods of his art may be distinguished. An early period (1621-26), thoroughly Flemish in character and reminding somewhat of Pieter Breugel the Elder. This is best represented in the "Peasants of Moerdyck," formerly in the Kahn collection, Paris, and "Peasants Feasting," in the Schloss collection, Paris. The paintings of his second or Haarlem period (1627-31), dominated by Hals, show fresher color and bolder brushwork and are larger in size. They are excellently represented in the well-known "Smoker" of the Louvre, the life-size "Drinker" and the little "Smoker" in the Schloss collection, the well-known "Tavern Interior" of the Dulwich Gallery, and similar subjects in Munich and elsewhere. His third or Antwerp period (1632-38) shows stricter composition, brilliant

Action of the Planets (1908), the Adams prize essay in the University of Cambridge for 1907. He edited at one time the *Transactions of the American Mathematical Society* and later became editor of the *Bulletin of the American Mathematical Society*.

BROWN, FORD MADDOX (1821-93). An English historical painter. He was born at Calais, France, and studied principally at Antwerp under Gustave Wappers. After further studies of the nude and of the old masters in Paris and Rome, he settled permanently in London in 1846. His *Wiclif* and *Chaucer* pictures, in the manner of Peter Cornelius and the German Pre-Raphaelites, were painted shortly afterward. One of these, "Wiclif Reading his Translation of the Bible" (1848), aroused Rossetti's admiration and caused his enrollment among Brown's pupils. The latter thus came into intimate relations with the Pre-Raphaelites (q.v.), upon all of whom he exercised a strong influence and was in turn afterward influenced by some of them, although he declined to join the society. His paintings are characterized by conscientious detail, careful archaeological study, and rugged truth. His "Pretty Baa-Lambs" has been called the first plein-air picture with figures that was ever painted. Among his most important works are: "Cordelia at the Bedside of Lear" (1849), "Chaucer Reading the Legend of Custance" (Municipal Gallery, Sidney), "Christ Washing Peter's Feet" (1852, National Gallery, London), "Work" (1863, Manchester Gallery), "The Last of England," "English Afternoon," and a historical series in the Town Hall, Manchester,—the most important work of his later years (1878-93). Consult Stephens, in *The Portfolio* (London, 1893), and the biography by his grandson, Hueffer (ib., 1896).

BROWN, FRANCIS (1849-1916). An American educator and biblical scholar. He was born in Hanover, N. H., and graduated at Dartmouth in 1870 and at Union Theological Seminary, New York City, as fellow of his class, in 1877. He then studied in Germany (1877-79), was appointed instructor in biblical philology at the Union Theological Seminary in 1879, and became associate professor of biblical philology there in 1881, and professor of Hebrew and the cognate languages in 1890. He became president of Union Theological Seminary in 1908 and was director of the American School of Oriental Study and Research in Palestine in 1907-08. He published *Assyriology: Its Use and Abuse in Old Testament Study* (1885) and contributions to periodicals. After 1883 he devoted himself chiefly to the preparation, in collaboration with Drs. C. A. Briggs and S. R. Driver, of the *Hebrew and English Lexicon of the Old Testament* (1891-1905), based on Gesenius. He also published *The Christian Point of View* (with A. C. McGiffert and G. W. Knox, 1902).

BROWN, SIR GEORGE (1790-1865). A British soldier. He was born in Scotland, entered the army in 1806, and was at the capture of Copenhagen. He rose to the rank of major in the Peninsular War, was sent with General Ross to the United States in 1814, was wounded at the battle of Bladensburg, and was promoted lieutenant colonel for his gallantry. For the next 25 years he served as a staff officer, becoming adjutant general in 1850 and lieutenant general in 1851. He then served in the Crimean War (1854-55), commanding the left wing at

Alma, and being severely wounded at Inkerman (Nov. 5, 1854). He returned to the front before the war was over, and commanded the expedition to the Sea of Azov, and the storming party in the first attack on the redan of Sebastopol. He was created G.C.B. in 1855, was promoted general in 1856, and in 1860 became commander in chief in Ireland.

BROWN, GEORGE (1818-80). A Canadian journalist and statesman. He was born at Alloa, Scotland, a seaport 35 miles from Edinburgh, and was educated at the high school and Southern Academy in that city. He came to New York with his father in 1838, but in 1843 he removed to Toronto and in 1844 founded, and became the first editor of, the *Globe*. His object was to aid in renewing the struggle for full responsible government and to oppose special privilege. At that time political feeling ran high, and the issues which compelled the rebellion of 1837-38 were yet smoldering. (See *POLITICAL PARTIES, Canada*.) In molding public opinion the *Globe* soon exerted a powerful influence, which became commanding after 1853, when the paper was issued as a daily. The impetuous eloquence and forceful personality of its editor had made him politically conspicuous, and in 1851 Brown was elected to the Parliament of Canada, where he soon became the ablest representative of the advanced Reformers. The measures for which he contended were representation in proportion to population, secularization of the clergy reserves (with disendowment of rectories), and unsectarian schools. (See *CANADA, History*.) Underlying the two latter was the acute issue, on which Reformers themselves were divided, as to diversion of public money to sectarian purposes. Brown opposed all sectarian money grants and brought with him a large section of his party. In 1858 he became Premier, but resigned after two days, on the refusal of the Governor-General, Sir Edmund Head (q.v.), to accept the advice of the ministry to dissolve Parliament. Constitutional difficulties due to the union of 1841 had practically reduced party government to deadlock, from which public attention was diverted to confederation as a solution. In order to lessen these difficulties and prepare the way for a true national life, Brown put aside his political and personal objections, and in 1864-65 acted as the Reform leader in a coalition ministry of which he and Mr. (afterward Sir) John Alexander Macdonald (q.v.) were the chief members. In the preliminary measures and eventual accomplishment of confederation he bore a foremost part, and also in the acquisition of the Northwest Territories by the new Dominion. In 1873 he was nominated a member of the Senate. In 1874, with Sir Edward Thornton, he successfully negotiated between Canada and the United States a reciprocity treaty which, however, the United States Senate refused to ratify. In his later years Brown had the satisfaction of knowing that the clergy reserves had been secularized (1854), largely through his efforts, and that representation by population had become a part of the Federal constitution; but the school system was not established wholly on an unsectarian basis. (See *ONTARIO, Education*.) On March 25, 1880, he was shot by a discharged employee, and died in the early morning of May 9. Consult: Dent, *Canadian Portrait Gallery* (Toronto, 1880); Mackenzie, *Life and Times of Hon. George Brown* (Toronto, 1882);

Lewis, "George Brown," in the *Makers of Canada Series* (Toronto, 1906).

BROWN, GEORGE (1835-1913). An American naval officer. He was born in Indiana, and entered the navy as a midshipman in 1849. He served throughout the Civil War, especially distinguishing himself on the night of Feb. 24, 1863, when, in command of the *Indianola* at Palmyra Island, he defended himself for an hour and a half against four Confederate gunboats. Finally he was wounded and taken prisoner, and his vessel was destroyed. He became a commander in 1866 and a rear admiral in 1893. He commanded the naval forces in the Philippines in 1889-92, and the Norfolk Navy Yard in 1886-90, and again in 1893-97. He retired in the latter year.

BROWN, GEORGE LOBING (1814-89). An American landscape painter. He was born in Boston and at first studied wood engraving under Alonzo Hartwell and worked as an illustrator. He studied painting with Washington Allston, but soon went to Europe, residing principally in Italy for years. The motives of his pictures are usually Italian, and there is nothing specifically American about them either in treatment or sentiment. Their composition is good, the coloring harmonious, but they are spoiled by being too theatrical. Among the best are "Sunset in Genoa" (1875), "Doges' Palace and Grand Canal," "Bay of Naples," "Niagara Falls in Moonlight," "The Bay of New York" (1869) was acquired by King Edward VII when visiting America as Prince of Wales.

BROWN, GEORGE WILLIAM (1812-90). An American jurist. He was born in Baltimore, Md., graduated in 1831 at Rutgers College in New Jersey, and was subsequently admitted to the bar. In 1860 he was elected mayor of Baltimore. On April 19, 1861, he marched through the city at the head of the Sixth Massachusetts Regiment, then on its way to the defense of Washington, and exerted himself to quell the riot which had arisen. He was a member of the Maryland Constitutional Convention of 1867, and Chief Judge of the Supreme Bench of Baltimore from 1873 to 1888. For a number of years he was professor of international and constitutional law in the University of Maryland, and he was one of the three compilers of the first *Digest of the Decisions of the Maryland Court of Appeals* (1847). He published numerous addresses, among them: *The Origin and Growth of Civil Liberty in Maryland* (1850), a *Sketch of the Life of Thomas Donaldson* (1881), and *Baltimore and the 19th April, 1861* (1887).

BROWN, GOULD (1791-1857). An American grammarian. He was born in Providence, R. I., and for 20 years was a teacher in New York. He published a series of excellent English grammars, including *A Grammar of English Grammars* (1851), an exhaustive and highly valuable treatment of the subject, and *Institutes of English Grammar* (1823; revised by J. W. Davis, 1907).

BROWN, HARVEY (1795-1874). An American soldier, born in Bridgetown (now part of Rahway), N. J. He graduated at West Point in 1818; was aid-de-camp to Major General Brown, then commanding general of the United States army, in 1824-25; and, as lieutenant colonel, took part in the Seminole War of 1835-38. In the Mexican War he served as major under both General Taylor and General Scott, and earned special mention at Monterey, Cerro

Gordo, Contreras, and the Gate of Belen, City of Mexico. For his services in the last two engagements he was brevetted lieutenant colonel and colonel respectively. In 1852-53 he again served against the Seminoles in Florida and in 1859-60 was inspector of artillery. At the outbreak of the Civil War he was in command at Washington and Fort McHenry (from January to April, 1861), and was then placed in command of Fort Pickens, Fla., where he earned the brevet rank of brigadier general by repulsing a Confederate attack on Nov. 22-23, 1861. He was afterward in command of the defenses of New York harbor from April, 1862, to August, 1863, was military commander of the city of New York from Jan. 15 to July 16, 1863, and earned the brevet rank of major general for his services in the suppression of the draft riots there on July 13-16. (See DRAFT RIOTS IN NEW YORK.) On Aug. 1, 1863, he was retired from active service.

BROWN, HENRY BILLINGS (1836-1913). An American jurist, an associate justice of the United States Supreme Court in 1890-1906. He was born in Lee, Mass., graduated at Yale in 1856, traveled in Europe for a year, and upon his return studied law at the Yale and Harvard law schools. He then removed to Detroit, Mich., where he was admitted to the bar in 1860. From 1863 to 1868 he was assistant United States District Attorney for the Eastern District of Michigan, and for several months in 1868 he was judge of the Circuit Court of Wayne County. In 1875 he was appointed by President Hayes United States district judge, which position he held until December, 1890, when he was appointed by President Harrison to the vacancy on the Supreme Court bench, from which he retired in 1906. In 1895 he compiled a valuable volume of admiralty reports.

BROWN, HENRY KIRKE (1814-86). One of the most prominent American sculptors of the early school, born in Leyden, Mass., Feb. 24, 1814. At 18 he studied portrait painting under Chester Harding in Boston, but, more attracted to sculpture, he spent several years in the West as a civil engineer in order to earn money necessary for a course in Italy. He then studied in Cincinnati, where, at the age of 23, he produced his first marble bust. From 1840 to 1842 he practiced his art at Albany, N. Y., producing many busts and some figure subjects. In 1842-46 he studied in Italy and sent home a number of the customary pseudo-classic figures, such as "Ruth" and "Boy and Dog," belonging to the New York Historical Society. On his return he settled in New York and afterward in Brooklyn. As a protest against classic subjects, he studied among the Indians and produced his well-known "Indian and Panther," probably the first bronze sculpture cast in the United States. For Brown had installed in his studio a miniature foundry, attending himself to the difficult process of casting. He was elected to the National Academy in 1851. In 1853 he began his masterpiece, the celebrated equestrian statue of Washington, unveiled in Union Square, New York, in 1856, which still ranks as one of the best equestrian statues in the country. Both horse and rider are admirably composed and well executed. The outlines are simple and compact, and the figure of Washington conveys the impression of commanding strength and nobility of character. Its excellence is especially evident when it is compared with Brown's other equestrian statues, Gen. Winfield Scott and

Nathanael Greene, in Washington, D. C. Brown is abundantly represented in Statuary Hall, Washington, by the standing figure of Gen. Nathanael Greene of Rhode Island, of Vice President George Clinton (of New York), Richard Stockton, and Gen. Philip Kearny of New Jersey. In 1858 he had almost completed the models for a group of 13 figures for the new State House of Charleston, S. C., when the Civil War put an end to the commission. Returning North, he resided for the rest of his life at Newburgh on the Hudson, where he died, July 7, 1886. Among his other works are the bronze statue of DeWitt Clinton (1855) in Greenwood Cemetery, Brooklyn, the statues of Lincoln in Union Square, New York, and Prospect Park, Brooklyn, and the portrait busts of William Cullen Bryant and Dr. Willard Parker. During his entire life Brown's art was a protest against the Italian influence. He was the first genuine American spirit working in a heretofore alien art. His earliest work is not different from the lifeless art of his day, but his later work is far more realistic. It is uniformly conscientious, although not always inspiring. He paid great attention to the detail of features and accessories, often losing the character of the individual portrayed. His activity as a teacher was important and influential. Consult Taft, *History of American Sculpture* (New York, 1903).

BROWN, JACOB (1775-1828). An American soldier, prominent as an officer in the War of 1812. He was born in Bucks Co., Pa., removed to New York in 1798; taught school and studied law in New York City; served as military secretary to Alexander Hamilton, and, removing to Jefferson County, founded the village of Brownsville. He here entered the State militia, was made brigadier general in 1810, and early in 1812 was placed in command of the frontier from Oswego to Lake St. Francis. He gained successes over the British at Ogdensburg and Sackett's Harbor on Oct. 4, 1812, and May 29, 1813, respectively; and in July, 1813, was appointed brigadier general in the regular United States army. In January, 1814, he was raised to the rank of major general, and soon afterward succeeded Wilkinson as commander of the Northern Department, though nominally Izard, who was then busy with the Wilkinson court of inquiry, was his superior. He took possession of Fort Erie on July 3, defeated General Riall at Chippewa (where General Scott commanded) on the 5th, and on the 25th met General Drummond in the battle of Lundy's Lane, General Scott having the principal command. After the war he remained for some time in command of the Northern Department, and from 1821 until his death he was general in chief of the United States army.

BROWN, J[OHN] APPLETON (1844-1902). An American painter, born in Newburyport, Mass. He studied in Boston under Benjamin C. Porter, and afterward under Emile Lambinet in Paris. In 1891 he established his studio in New York City and the following year became a member of the Society of American Artists. He was elected to the National Academy in 1896. His last picture, exhibited at the Society in 1902, "The Grain Field," was a typical example of his delicate personal handling of color. Other works by him are "Old Road near Paris" and "On the Merrimac at Newburyport." His spring and summer pictures in bright soft colors are full of fine poetic feeling.

BROWN, JOHN, OF HADDINGTON (1722-87). A Scottish clergyman and commentator. He was born at Carpow in Perthshire. He showed an early disposition to piety and a taste for learning as well. While herdsman to a shepherd on the hills, he acquired a good knowledge of Latin, Greek, and Hebrew, so astonishing the country folk by his attainments that they credited him with diabolical assistance. After a brief career as a peddler, he enlisted in a regiment of militia raised against the Jacobites in 1745; later he became a schoolmaster near Kinross, studying theology in his spare hours. In 1750 he was licensed as a preacher in the Burgher branch of the secession church, and in the following year set over the congregation of Haddington, which he never left, though called (in 1784) to the pastorate of the Dutch Church in New York. In 1786 he was made professor of divinity. His holy and devoted character was universally respected. David Hume was once prevailed upon to go and hear him and is said to have exclaimed: "That old man preaches as if Christ were at his elbow." His best-known work was the *Self-Interpreting Bible* (1778), a complete library of scriptural knowledge, long immensely popular in Scotland. He published a great variety of sermons and tracts. For his life, consult the preface to his *Select Remains*, ed. by his son, the Rev. William Brown (Edinburgh, 1856).

BROWN, JOHN (1736-88). A Scottish physician, the founder of the Brunonian system of medicine. He was born at Buncle, Berwickshire, the son of a day laborer. He was educated at the grammar school of Duns, in which he was subsequently an usher, and after studying medicine at the Edinburgh University, became tutor to the children of the celebrated Dr. Cullen, and assistant in his university lectures. He took the degree of M.D. at the University of St. Andrews in 1779, and in 1780 published his *Elementa Medicinæ*. According to his system all diseases are divided into the sthenic, or those depending on an excess of excitement, and the asthenic, those resulting from a deficiency of it; the former to be removed by debilitating medicine, as opium, and the latter by stimulants, such as wine and brandy. His system gave rise to much opposition, but his partisans were numerous, and for a time his opinions had some influence. He was also the author of *Observations on the Old System of Physic* (1787). In 1780, overwhelmed with debt, he removed to London, where he died of apoplexy in 1788. His works, with a memoir by his son, Dr. William Cullen Brown, appeared in 1804 (3 vols.). Consult Berdoe, *The Origin and Growth of the Healing Art* (London, 1894).

BROWN, JOHN (1736-1803). An American merchant, born in Providence, R. I., the most energetic of the four sons of James Brown (1666-1732), commonly known as the "Brown brothers." He was very successful in business and was also prominent in politics, especially during the Revolutionary War. Foreseeing this conflict, he brought to this country in his ships large quantities of powder which was supplied to the army at Cambridge when the soldiers had only about four rounds to the man. He organized and led the party which, on June 17, 1772, destroyed the British sloop of war *Gaspée* and he was active in the antislavery movement. He served in Congress from 1799 to 1801. For 20 years he was the treasurer of the Rhode Island

College (now Brown University). He laid the corner stone of the first building of that institution and contributed generously to its endowment fund.

BROWN, JOHN (1744-80). An American soldier, born in Sandisfield, Mass. He graduated at Yale in 1771, studied law in Providence, and practiced his profession in what is now Johnstown, N. Y., where he became a King's attorney. In 1774 he was sent to Canada to urge the people there to join the 13 Colonies in their opposition to the arbitrary measures of the British government. He was with Ethan Allen at the capture of Ticonderoga and at Quebec when Montgomery was killed. Soon afterward he was made a lieutenant colonel in the Continental army. In 1777 he surprised the outposts at Ticonderoga, was with Gates when Burgoyne surrendered, and was killed by Indians while on the way to help Schuyler in the Mohawk valley campaign of 1780.

BROWN, JOHN, D.D. (1784-1858). A Scottish religious author, grandson of John Brown of Haddington. He was born, July 12, 1784, near Whitburn, Linlithgowshire. He studied in Edinburgh University (1797-1800) and the theological hall of the church in Selkirk (1800-04). In 1806 he was ordained to the pastorate of a Burgher church in Biggar, a small town in Lanarkshire, where he labored for 15 years, employing his leisure hours in those studies which subsequently enabled him to take a high rank as a biblical expositor. In 1822 he was transferred to Rose Street Church, Edinburgh, and in 1829 to Broughton Place Church in the same city. In 1834 he was appointed professor of pastoral and exegetical theology in connection with the associate synod. In 1847 he passed with his congregation over into the United Presbyterian Church. He died in Edinburgh, Oct. 13, 1858. As a preacher, Dr. Brown was among the first of his time. For clearness of scriptural exposition, chaste and powerful language, and majestic ardor and earnestness of manner, he had no equal in his denomination and no superior in Scotland. The attractiveness of his delivery was heightened by a countenance singularly noble, tender, and sweet. Among his works are: *The Law of Christ Respecting Civil Doctrine* (1839); *The Resurrection of Life* (1852); and his important and scholarly *Expository Discourses on the Epistle of First Peter* (3 vols., 1848); *Discourses and Sayings of Christ* (3 vols., 1850); on the *Epistle to the Galatians* (1853); on the *Epistle to the Romans* (1857); and that to the *Hebrews* (1862). For his life, consult Cairn's *Memoir* (Edinburgh, 1860).

BROWN, JOHN (1800-59). An American abolitionist of the extremely radical type. He was born at Torrington, Conn., May 9, 1800, of Puritan ancestry. In his earlier years he engaged in the wool business and in a variety of other pursuits, in all of which he was uniformly unsuccessful. He was twice married, and became the father of a score of children, but he seems not to have shown either the disposition or the ability properly to maintain a family. His roaming career in Ohio, Connecticut, and New York was not such as to secure for him the standing even of an average citizen. He was, however, a man of much natural force, and upon becoming imbued with the single idea which controlled his later life he appeared as an agitator of great power, although manifesting many

of the characteristics of the fanatic. His life work has given rise to a marked diversity of opinion, some considering his deeds highly reprehensible if not criminal, while others have regarded his life and death as scarcely different from those of a martyr. The latter view was early prevalent throughout the North, and was upheld by many reputable abolitionists (q.v.), by the leaders among whom Brown seems to have been encouraged and assisted from the beginning of his work in Kansas until the time of the final catastrophe in Virginia. Brown first appeared as a public character in the struggle which the free-state men were making for the control of Kansas (q.v.). He was somewhat prominent at Lawrence in the critical days of December, 1855, and soon made himself notorious by the massacre of five of his opponents at Pottawatomie on the night of May 24, 1856.

This was followed, on June 2, by his capture at Black Jack of Captain Pate. In the following August he won national renown by the heroic stand which he made at Osawatimie against an overwhelming force of invaders from Missouri. While he thus took a most vigorous share in the critical border war, he became the exponent of the bloodiest and most unscrupulous type of frontier ruffianism. After the conclusion of violence in Kansas Brown seems to have maintained relations with his respectable and wealthy sympathizers in the Northeastern States, and by them he was encouraged and materially aided in his efforts to free the blacks. The culmination of long secret planning came in the fall of 1859, when, after having as a blind taken a farm near his objective point, he led a band of fewer than a score of followers into Harper's Ferry on the night of Oct. 16, 1859, and seized the national arsenal, thus giving what he supposed would be the signal for a general insurrection of the slaves. This audacious act, however, resulted only in calamity for the participants, and in so embittering and arousing the South as to make any peaceful arrangement of the slavery problem a still more remote probability. Troops of the regular army, under command of Robert E. Lee (q.v.), soon regained control of the arsenal and captured Brown and his followers. Brown was tried, convicted of "treason, and of conspiring and advising with slaves and others to rebel, and of murder in the first degree"; was sentenced to death, and was executed at Charlestown, W. Va., Dec. 2, 1859. He was buried at North Elba, N. Y. During the following years a popular song in the North had the refrain:

"John Brown's body lies a-mouldering in the grave,
But his soul goes marching on."

The general approval of his deed in the North served only to impress upon the South the extremes to which certain Northerners might go, and the futility of hoping for any uncontested maintenance of slavery in the Union. Brown's biographer, Sanborn, has said: "Although John Brown would have justified a slave insurrection, or indeed almost any means of destroying slavery, he did not seek to incite general insurrection among the Southern slaves. The venture in which he lost his life was not an insurrection in any sense of the word, but an invasion or foray." On the other hand, a recent writer, speaking of the Harper's Ferry affair, has said that "it was crime, and nothing but crime, common crime and public crime, crime that made

violent and destructive means possible and actual, and seemingly necessary for the attainment in the United States of that principle of the world's civilization which has decreed the personal freedom of all men." Of his 20 children, eight died in early childhood. The sons who grew to manhood took an active part in their father's work and obeyed him implicitly. Five of them removed to Kansas in 1854 and immediately entered with enthusiasm into the struggle with the proslavery settlers; and four of them participated in the Harper's Ferry raid, of which Owen Brown, who died in 1889, was long the only survivor. A work entitled *Life and Letters of John Brown, Liberator of Kansas and Martyr of Virginia*, edited by F. B. Sanborn (Boston, 1885), gives a sympathetic and exhaustive biography. For an unfavorable estimate of Brown, consult Burgess, *The Civil War and the Constitution* (New York, 1901). For a judicial estimate, consult Rhodes, *History of the United States from the Compromise of 1850*, vol. ii (New York, 1893). His most recent biographer is Villard, *John Brown, 1800-1859: A Biography Fifty Years After* (Boston and New York, 1910).

BROWN, JOHN (1810-82). A Scottish physician and author. He was born at Biggar, Lanarkshire, Scotland, Sept. 22, 1810; studied in the University of Edinburgh, and practiced medicine in that city. His practice was successful, but not large, and his fame rests mainly on his literary works, which consist of the sketches termed *Horæ Subsecivæ* (3 vols., 1858, 1861, 1882), and of the widely read *Rab and his Friends* (1859). His literary motto was that an author should not publish anything "unless he has something to say and has done his best to say it aright," and for this reason he published but little, distrusting his own powers and subjecting what he wrote to the severest criticism. But the little he did produce is marked by a winning tenderness and humor. He died, May 11, 1882, after an uneventful and somewhat melancholy life. Consult Peddie, *Recollections of Dr. John Brown* (London, 1893).

BROWN, JOHN GEORGE (1831-1913). An American genre painter of English extraction. He was born at Durham, Nov. 11, 1831, and studied in Newcastle-on-Tyne, Edinburgh, and, after his removal to the United States, in 1855, with Thomas Cummings in New York. He was elected to the National Academy of Design in 1863, was its vice president, 1899-1904, and originated the idea of the removal of the Academy to its new site in 110th Street. Until his death in 1913 he was almost a yearly exhibitor. He was an original member of the Water Color Society (1866), and repeatedly its president. Brown's art is best characterized as British genre paintings adapted to American subjects. Essentially literary, it is executed with precise detail, but is poor in color, and more popular with the general public than with connoisseurs. His favorite subjects are New York bootblacks and street urchins, and his best-known works include: "His First Cigar," "The Passing Show" (1877), "A Merry Air and a Sad Heart" (1880), "Street Boy" (1882), "The Gang" (1895), "Street Boys at Play," "Heels over Head" (1900), "A Builder of Boats" (1905), "The Industrious Family" (1906).

BROWN, JOHN LEWIS (1829-92). A French battle, animal, and genre painter. He was born in Bordeaux of a Scottish family of Stuart par-

tisans. He studied in the Ecole des Beaux-Arts with Roqueplan and Belloc. He is known for his pictures of hunting and military scenes, and his studies of horses and dogs. He painted a number of admirable pictures from the American Revolutionary War, the Seven Years' War, and the War of 1870. His presentation is clever and humorous, his work characterized by refinement and charm. The Luxembourg possesses his "Before the Start"; the Gallery of Dublin, "The Mountebank." He was also an excellent etcher and aquarellist. Consult Bénédite in *Revue de l'art ancien et moderne*, vol. xiii (Paris, 1903).

BROWN, JOHN NEWTON (1803-68). A Baptist divine. He was born in New London, Conn., June 29, 1803, graduated at Madison (now Colgate) University, 1823; was pastor in various places, professor of theology and ecclesiastical history in the New Hampton Theological Institution, New Hampshire, 1838-45, editorial secretary of the American Baptist Publication Society, and editor of the *Christian Chronicle* and *National Baptist*, Philadelphia, from 1849 till his death in Germantown, Pa., May 15, 1868. He edited *The Encyclopædia of Religious Knowledge* (1835) and wrote *The New Hampshire Confession* (1852), which is of interest in the history of the Baptist churches.

BROWN, JOHN YOUNG (1835-1904). An American lawyer and politician. He was born in Hardin Co., Ky., graduated at Centre College, Danville, in 1855, and was admitted to the bar in 1857. He was elected to Congress in 1859, but not having reached the minimum age prescribed by the Constitution for Congressmen, he was not allowed to take his seat until the second session. He was elected to Congress again in 1868, but was excluded by political disabilities. He sat in Congress during 1873-77, after which he devoted himself to his legal practice. He served as Governor of Kentucky from 1891 to 1895 and in 1897 ran for Governor as "an honest election Democrat," against Taylor and Goebel. He was widely known as an orator.

BROWN, JOSEPH EMERSON (1821-94). An American lawyer and politician. He was born in South Carolina, but early in life removed to Georgia. He graduated at the Yale Law School in 1846 and immediately engaged in the practice of his profession, but soon entered politics and in 1849 was elected to the State Senate. He was chosen Governor by the Democrats in 1857 and by reelection held that office until after the Civil War. He was an active Secessionist, seizing the Georgia forts before the State left the Union and raising an army of 10,000 old men and boys to prevent General Sherman from passing through the State on the famous march to the sea. He, however, opposed President Davis's conscription measures and in 1868 advised his State to accept the reconstruction policy. His party turned against him when he supported General Grant for the presidency and defeated him when he sought election to the United States Senate as a Republican. He was then appointed Chief Justice of the Supreme Court of Georgia, but resigned in 1870 to become president of the Western and Atlantic Railroad Company. In 1872 he returned to the Democratic party and in 1880 was elected to the United States Senate, serving until 1891. He made large gifts for religious and educational purposes. Consult Fielder, *Life and Times of Joseph E. Brown* (Springfield, 1883).

BROWN, KENNETH (1868-). An American author, born in Chicago. He studied in Germany, Switzerland, and Paris, and at Harvard and the University of Virginia. For some years he was in newspaper work in Boston, New York, Baltimore, and Chicago, and in 1898-1900 was a second time in New York—as editorial writer for the *Commercial Advertiser*. He wrote: *Eastover Court House* (1901) and *The Redfields Succession* (1903), both with Henry Burnham Boone; *Sirocco* (1906); *The First Secretary* (1907) and *The Duke's Price* (1910), both in collaboration with his wife; and a juvenile, *Two Boys in a Gyrocar* (1911).

BROWN, MARTHA McCLELLAN (1838-). An American lecturer and reformer, born in Baltimore and educated at the Pittsburgh College. She lectured much on temperance, was one of the chief organizers and officers of the Order of Good Templars, originated (1870) the Temperance Cadet movement, and helped to introduce Bible temperance lessons in the International Lesson Leaves. Although one of the organizers of the Prohibition party, she left it when it abandoned woman's suffrage in 1896. In 1874 she founded the National Woman's Christian Temperance Union at Chicago, and in the same year conducted a State campaign which resulted in the defeat of the liquor license in Ohio. From 1882 to 1892 she was vice president and professor in the Cincinnati Wesleyan College, during this period also making efforts on behalf of the Fresh Air movement. She contributed numerous articles on reform subjects to newspapers and magazines.

BROWN, NICHOLAS (1769-1841). An American merchant and philanthropist, born in Providence, R. I. He graduated at Rhode Island College in 1786. Five years later he inherited his father's fortune and soon thereafter organized, with Thomas P. Ives, the business house which has since continued under the same firm name. He was one of the most generous patrons of the Rhode Island College, and in 1840 that institution took his name in recognition of his benefactions. His gifts to the college aggregated \$100,000, and he also gave nearly \$10,000 to the Providence Athenaeum and bequeathed \$30,000 for an asylum for the insane at Providence. Consult Hunt, *Lives of American Merchants* (New York, 1856).

BROWN, NORRIS (1863-). An American legislator, born in Maquoketa, Iowa, and a graduate of the State University of Iowa. He practiced law from 1884 to 1892, was then county attorney of Buffalo Co., Neb., for four years, and in 1900-04 was Deputy Attorney-General of the State. He was Attorney-General from 1904 to 1906. In 1907 he was elected United States Senator for the term ending 1913. He was a candidate for renomination, but was defeated at the primaries in 1912 by George W. Norris (q.v.).

BROWN, ROBERT (1773-1858). An eminent Scottish botanist. He was born in Montrose, Dec. 21, 1773, the son of an Episcopal clergyman, and was educated at Marischal College, Aberdeen. Having studied medicine at the University of Edinburgh, he became, in 1795, ensign and assistant surgeon in a Scottish fencible regiment, with which he went to Ireland. Devoting himself to the study of botany, he resigned his commissions in 1800, and the following year was, on the recommendation of Sir Joseph Banks, engaged as naturalist in the expedition sent out

under Captain Flinders for the survey of the Australian coasts. On his return, in 1805, he brought home nearly 4000 species of Australian plants, a large proportion of which were new to science. Soon after he was appointed librarian to the Linnean Society. To the *Transactions* of the Edinburgh Wernerian Society and those of the Linnean Society, he contributed memoirs on *Asclepiadæ* and *Proteaceæ*, and published *Prodromus Floræ Novæ Hollandiæ et Insulæ Van Diemen*, vol. i (1810); a supplement to this work appeared in 1830, relating to the *Proteaceæ* only. He also wrote the *General Remarks, Geographical and Systematical, on the Botany of Terra Australis* (1814), attached to the narrative of Captain Flinders's expedition. His adoption of the natural system of Jussieu, the French botanist, led to its general substitution in place of the Linnean method. Brown's numerous memoirs in transactions of societies, and other contributions to botanical science, secured the universal approval of the title conferred on him by Alexander von Humboldt of *Botanicorum facile princeps*. Probably his most notable discovery was "gymnospermy." Before this discovery Gymnosperms were placed under Angiosperms, and their seeds were interpreted as seed cases. From comparative studies Brown concluded that the seeds of this group are not inclosed, and in this way the group Gymnosperms ('naked seeds') was established as distinct from Angiosperms. In 1810 Brown received the charge of the library and splendid collections of Sir Joseph Banks, which in 1827 were transferred to the British Museum, when he was appointed keeper of the botanical department in that establishment. In 1811 he became a fellow of the Royal Society, which in 1839 awarded him the Copley medal for his *Discoveries during a Series of Years on the Subject of Vegetable Impregnation*. Oxford conferred on him the degree of D.C.L. in 1832; the Academy of Sciences of the French Institute elected him a foreign associate; and the King of Prussia decorated him. He was president of the Linnean Society from 1849 to 1853, and died in London, June 10, 1858. His *Miscellaneous Botanical Works* (ed. Bennett) were published in 2 vols. (1866-68). See BROWNIAN MOVEMENTS.

BROWN, ROBERT (1842-95). A Scottish scientist and author. He was born in Campsie, Caithness, and studied in Edinburgh, Leyden, Copenhagen, and Rostock. He visited Spitzbergen, Greenland, and the western shore of Baffin's Bay (1861), and subsequently carried on scientific investigations among the islands of the Pacific and on the Venezuelan, Alaskan, and Bering shores, making charts of all the unknown interior of Vancouver and writing much on the fauna and flora of those countries. With E. Whymper, in 1867, he attempted to penetrate the inland ice of Greenland and made many discoveries concerning its nature which have since been confirmed by Peary. He afterward traveled in the Barbary States of North Africa, was a lecturer on geology, botany, and zoölogy in Edinburgh and Glasgow, and was a member of many learned societies in England, America, and on the Continent. He removed to London in 1876 and thereafter devoted himself entirely to literary work. In addition to many scientific memoirs, and articles and reviews in various languages, his publications include: *Manual of Botany* (1874); *Science for All* (5 vols., 1877-82); *Peoples of the World* (5 vols., 1882-85);

The Story of Africa and Its Explorers (4 vols., 1892-95; new ed., 1911).

BROWN, SIR SAMUEL (1776-1852). An English engineer. He was born in London, served with distinction in the British navy, and became a retired captain in 1842. He is best known for his method of making iron chain cables and as a designer and builder (1822) of the first iron suspension bridge in England, across the Tweed at Berwick. In 1823 he constructed the chain pier at Brighton.

BROWN, SAMUEL GILMAN (1813-85). An American educator. He was born in North Yarmouth, Me., the son of President Francis Brown of Dartmouth College, graduated at Dartmouth in 1831 and at Andover Theological Seminary in 1837; was professor of oratory and belles-lettres in Dartmouth from 1840 to 1863, and held the chair of intellectual philosophy and political economy from 1863 to 1867. From 1867 to 1881 he was president of Hamilton College. Among his published works are *Biographies of Self-Taught Men* (1847) and an excellent and authoritative *Life of Rufus Choate* (2 vols., 1862). Consult *Memorial of Samuel Gilman Brown* (New York, 1885).

BROWN, SAMUEL ROBBINS (1810-80). An American missionary to China. He was born in Connecticut, graduated at Yale in 1832, studied theology in Columbia, S. C., and taught for four years (1834-38) in the New York Institution for the Deaf and Dumb. In 1838 he went to Canton and opened, for the Morrison Education Society, the first Protestant school in the Chinese Empire—a school in which were taught Yung Wing and other pupils who afterward came to the United States. The several annual reports on this school were published in the *Chinese Repository* for 1840 to 1846, to which he contributed some of his papers on Chinese subjects. After nine years' service, his wife's health failing, Dr. Brown returned to the United States and became a pastor and teacher of boys at Owasco Outlet, near Auburn (1851-59). He worked for the formation of a college for women, which was situated first in Auburn and then in Elmira, N. Y. When, by the Townsend Harris treaty of 1858, Yokohama and Nagasaki in Japan were opened to trade and residence, Dr. Brown sailed for the former port and opened a school in which hundreds of young men, afterward leaders in various walks of life, were educated. He translated the New Testament, and taught and preached for 20 years. He was one of the founders of the Asiatic Society of Japan and in many ways was one of the most prominent makers of the New Japan. He is buried at Monson, Mass., his boyhood's home. He has published: *Colloquial Japanese* (1863), a grammar, phrase book, and vocabulary; *Prendergast's Mastery System Adapted to the Japanese*; translation of Arai Hakuseki's *Sei Yo Ki Bun*; or, *Annals of the Western Ocean*. Consult Griffiths, *A Maker of the New Orient* (New York, 1902).

BROWN, SANGER (1852-). An American physician. He was born at Bloomfield (Ontario), Canada, graduated in 1880 at the Bellevue Hospital Medical College (New York City), was assistant physician at the Bloomingdale Asylum for the Insane (White Plains, N. Y.) in 1882-85, and acting medical superintendent there in 1886. In 1890 he was appointed professor of neurology in the Post-Graduate Medical School of Chicago, and in 1901-06 was asso-

ciate professor of medicine and clinical medicine at the College of Physicians and Surgeons in the same city. In his experiments with E. A. Schäfer at University College, London, in 1886-87, he was the first to demonstrate conclusively that in monkeys the centre of vision is located in the occipital lobe. In 1908 he joined the United States army Medical Reserve Corps with rank of first lieutenant.

BROWN, STIMSON JOSEPH (1854-1923). An American astronomer, born at Penn Yan, N. Y. He was educated at Cornell University and at the United States Naval Academy. He served on the United States Coast and Geodetic Survey, became professor of mathematics (U. S. N.) in 1883, and astronomical director of the United States Naval Observatory in 1898. Having been on duty in the United States Naval Academy since 1901, in 1907 he became the head of the department of mathematics and mechanics. He is the author of *Practical Algebra* (1908, 1910) and *Analytical Geometry and Curve Tracing* (1907; rev. ed., 1912), texts for the use of midshipmen.

BROWN, THOMAS (1663-1704). An English wit and miscellaneous writer, born at Shifnal, Shropshire. He studied at Christ Church, Oxford; was usher and afterward head master of a school at Kingston-on-Thames, and for several years maintained himself in London by translating from Greek, Latin, Spanish, and French, and by composing those satirical pamphlets and poems which led Addison to refer to him as "of facetious memory." About 1691 he established the *Lacedæmonian Mercury*, early defunct. His *Satyr on the French King* got him into prison, whence he is said to have obtained his release by a plea couched in the form of a Pindaric ode. It must be confessed that considerable of his writing, such as the verses in which he apostrophizes Durfey as "thou cur" and "thou mongrel," is but the sheerest fury of abuse. He is probably best known in connection with the story which relates that Dr. Fell, dean of Christ Church, had threatened him with expulsion; but, pacified by a supplicatory letter, agreed to let him off if he would make an extempore rendering of Martial's epigram, i. 32:

"Non amo te, Sabidi, nec possum dicere quare:
Hoc tantum possum dicere, non amo te."

Brown is said to have responded forthwith:

"I do not love thee, Doctor Fell,
The reason why I cannot tell;
But this I know, and know full well,
I do not love thee, Doctor Fell."

BROWN, THOMAS (1778-1820). A Scottish metaphysician, born at Kilmabreck, Kirkcudbrightshire. He went to Edinburgh in 1792, but without completing the course in arts he began the study of law and shortly abandoned it for medicine. On completing his medical studies in 1803, he became (1806) the partner of Dr. Gregory in his large practice. But his strong bent was for literature and philosophical speculation. At the age of 20 he had published a criticism of Darwin's *Zoonomia*, and he contributed to the second number of the *Edinburgh Review* (January, 1803). In 1804 he published a defense of Hume's doctrine of the relation between cause and effect; the third edition of this work (1818) appeared under the title of *An Inquiry into the Relation of Cause and Effect*. According to Brown causation is nothing but immediate and invariable antecedence; he differed from Hume,

however, in maintaining that we have an intuitive assurance of the causal relation. In this way the skeptical feature of Hume's theory was eliminated. (See CAUSALITY; HUME.) Dugald Stewart, professor of moral philosophy in the university, being obliged, from bad health, to retire in 1810, got Brown appointed associate, and later his successor, which office Brown continued to discharge till his death. He was popular as a professor, and his *Lectures on the Philosophy of the Human Mind* went through a great many editions. He also wrote some commonplace poetry. Brown followed Berkeley in making the consciousness of spatial externality a development out of temporal experience, and in general was true to the traditions of the Associationists, making much of "suggestion." He is credited with having differentiated for the first time the important class of muscular sensations. In his *Lectures on Ethics* (ed. by Dr. Chalmers, 1856), he derived the moral feeling from the social instincts.

BROWN, THOMAS EDWARD (1830-97). An English poet, born in the Isle of Man, the son of a Manx clergyman. After attending King William's College (1845-49), he was admitted to a servitorship at Christ Church, Oxford (1849). Though he was much humbled by his quasi-menial position, his university career was very brilliant. He obtained a double first class (1853) and a fellowship at Oriel (1854). After serving for a short time as vice principal of King William's College, in his native island, and head master of the Crypt School, Gloucester, he became assistant master at Clifton College, Bristol, a post which he held for 30 years. In 1892 he resigned, and passed the rest of his life on the Isle of Man. He died, Oct. 29, 1897, at Clifton College, where he was on a visit. Brown's published poems comprise: *Betsy Lee* (1873); *Poet's Yarns, Including Betsy Lee* (1881); *The Doctor and Other Poems* (1887); *The Manx Witch and Other Poems* (1889); *Old John and Other Poems* (1893).

Outside of Brown's circle of friends, these poems attracted little attention in England and none at all in the United States. But when they were collected in 1900 and published simultaneously with two volumes of letters, all the leading reviews took them up. Written mainly in the Anglo-Manx dialect, they possess great charm through odd and picturesque phrases. For example, a periphrasis for morning is "When the sun was jus' puttin' on his shoes." Though possessing marked lyrical qualities, they are mainly narrative, and thus have high significance after the long reign of the lyric. Indeed, *The Doctor* is a psychological novel in verse. The most carefully drawn character in the poems is Tom Baynes, a Manx sailor, who appears as narrator or actor. A like individuality pervades the strong and manly letters, descriptive of travels, scenery, and work, interspersed with fresh criticisms of many writers so opposite as Quarles and Flaubert. Consult *Collected Poems and Letters* (London and New York, 1900).

BROWN, SIR WILLIAM (1784-1864). An English merchant and philanthropist. He was born at Ballymena, Ireland, but in 1800 accompanied his parents to Baltimore, Md., where he became his father's partner in the linen business. In 1809 he established a Liverpool branch of the house (now in the cotton trade), which became one of the largest mercantile and banking firms in the world—Brown, Shipley & Co. A Liberal

reformer, he took a prominent part in local and public affairs, and was elected to Parliament four times (1846-59). He advocated free trade and the adoption of a decimal coinage. In 1857 he subscribed £40,000 for the establishment of a free public library in Liverpool, and the original library building was erected by him, and the Derby Museum by his son. He was knighted in 1863.

BROWN, WILLIAM ADAMS (1865-). An American theologian, born in New York City, and a graduate of Yale and Union Theological Seminary; he studied also in Berlin. Ordained to the Presbyterian ministry in 1893, he had a year earlier begun teaching at Union Seminary, and in 1898 he was appointed professor of systematic theology. The radical (some said heretical) tone of his contributions to the *American Journal of Theology* and more especially the *Harvard Theological Review* (January, 1911) aroused the opposition of conservatives in the Presbyterian church, and at the General Assembly of 1913 this faction took occasion to criticise him sharply. He wrote for Hastings, *Dictionary of the Bible and Hastings, Encyclopedia of Religion and Ethics*, and published: *Musical Instruments and Their Homes* (1888, with Mary E. Brown); *The Essence of Christianity* (1902; new ed., 1913); *Christian Theology in Outline* (1906); a biography of Morris K. Jesup (1910); *Christian Hope: A Study in the Doctrine of Immortality* (1912).

BROWN, WILLIAM C. (1853-1924). An American railroad official, born in Herkimer Co., N. Y. His parents early moved to Iowa, where he received a common-school education. While a youth he began railway service "wooding" engines, but during the period that he was a section hand he studied telegraphy, and by 1876 was a train dispatcher on the Chicago, Burlington, and Quincy. He served as general manager of several Middle-Western roads from 1890 to 1901, becoming in the latter year vice president and general manager of the Lake Shore and Michigan Southern. In 1902-09 he was senior vice president and director, and in 1909-13 president of the entire New York Central system. He resigned late in 1913 and was succeeded by Alfred H. Smith. Within his short administration were completed the Grand Central terminal in New York and the electrification of the company's entrance to the city, besides numerous other improvements. His contributions to periodicals deal with the cost of living and the relations of the railways to the people.

BROWN, WILLIAM GABBOTT (1868-1913). An American historian, born in Marion, Ala. He graduated at Howard College (Ala.) in 1886 and at Harvard University in 1891. In 1892 he became an assistant librarian at Harvard, serving till 1900, when he was appointed lecturer on American history. He wrote: *A History of Alabama* (1900); *Andrew Jackson* (1900); *Stephen Arnold Douglas* (1902); *The Lower South in American History* (1902); *The Foe of Compromise, and Other Essays* (1903); *Life of Oliver Ellsworth* (1905).

BROWN, WILLIAM GEORGE (1853-). An American chemist, born at Newcastle-on-Tyne, England. He came with his parents to Virginia in 1869 and was educated at the University of Virginia, at Harvard, and at Heidelberg. After serving as professor of chemistry and instructor in geology and mineralogy from 1877 to 1879 in the East Tennessee University, and for one

year as professor of general and agricultural chemistry in the University of Tennessee, he became instructor in chemistry at the University of Virginia in 1883, and then professor of chemistry and physics at the South Carolina Military Academy in 1885. From 1886 to 1894 he was professor of chemistry at Washington and Lee University, and from 1894 to 1896 assistant chemist in the United States Department of Agriculture. He took up work in the University of Missouri as professor of chemistry in 1896, becoming director of laboratories in 1905, and professor of industrial chemistry in 1910. From 1904 to 1911 he was editor of the *University of Missouri Studies*. He published *Chemistry* (1912).

BROWN, WILLIAM MONTGOMERY (1855-). An American Protestant Episcopal divine. He was born at Orrville, Wayne Co., Ohio, and while in charge of Grace Church, Galion, Ohio, erected seven missions in that district. He became general missionary and archdeacon of the diocese of Ohio in 1891, Bishop Coadjutor of Arkansas in 1898, and Bishop of Arkansas in 1900. He is the author of *The Crucial Race Question* (1907) and *The Level Plan for Church Union* (1910).

BROWN AL'GÆ. See **ALGÆ**; and **PHÆOPHYCÆ**.

BROWN'-BAND'ED SNAKE. See **DEATH ADDER**.

BROWN BEAR, THRUSH, ETC. See **BEAR, THRUSH, ETC.**

BROWN BESS. A term applied to the English flintlock in the latter part of the eighteenth century. The adjective probably arises from the brown color of the butt.

BROWN COAL. See **LIGNITE**.

BROWNE, BELMORE. An American explorer and writer. He was educated at St. Mark's School and the Pomfret School. In 1906, together with H. C. Parker, Dr. Frederick A. Cook, and others, he went on an exploring trip to Mt. McKinley; the party divided, and upon returning Cook claimed to have reached the summit of the mountain. Partly to obtain data for disproving this claim, and partly to attempt again the ascent themselves, Browne and Parker set out (1910) as coleaders of a new party, and although unable to reach the top they proved that Cook had fabricated the story of his climb. In 1912 a third attempt was made, but this time another failure to attain the summit was overshadowed by the establishing of a new mountain-climbing record for North America, 18,500 feet. Browne's experiences are chronicled in his book, *The Conquest of Mt. McKinley* (1913).

BROWNE, CHARLES FARRAR (1834-67). An American humorist, best known as "Artemus Ward." He was born at Waterford, Me., April 26, 1834. He began life as a printer in the office of the *Skowhegan Clarion*, and at 15 was a compositor for a comic weekly journal in Boston, *The Carpet Bag*, to which he made occasional contributions. He then became reporter of the *Cleveland Plain Dealer*, and conceiving the idea of writing in the character of a showman, he began a series of *Artemus Ward's Sayings*, intentionally atrocious in spelling, but of humor that soon gained him notoriety. In 1860 he moved to New York and joined the editorial staff of *Vanity Fair*. The first of his humorous lectures, "The Babes in the Wood," was delivered in Brooklyn and proved so successful that he abandoned journalism for the platform. In

1862 he visited California and Utah, gathering materials for a series of comic lectures on the Mormons, "whose religion is singular but their wives are plural." Consumption attacked Browne in 1864, and for two years he withdrew from the public. In 1866, his health improving, he undertook a professional tour in England, where he lectured with very great success for three months, almost to the eve of his death. His lectures and humorous writings are collected as *Artemus Ward, His Book* (1865); *Artemus Ward, His Travels* (1865); *Artemus Ward in London* (1867). There is an edition of the *Works*, with a memoir by Melville D. Landon (1875), and later editions are numerous.

BROWNE, CHARLES FRANCIS (1859-1920). An American landscape painter, born at Natick, Mass. He studied in the art schools of the Boston Museum, in the Pennsylvania Academy of Fine Arts, and, from 1887 to 1890, with Gérôme and Schenck in Paris. He early became identified with the Art Institute of Chicago as an instructor in landscape painting and a lecturer on the History of Art, but is more widely known as editor of *Brush and Pencil*. He is very prominently identified with the art life of the West, being an influential member of the Society of Western Artists and the Chicago Society of Artists. His art is well represented in the Union League Club, Chicago, and in several private collections in Providence, R. I. He is also an etcher of note and a member of the National Etchers' Society.

BROWNE, EDWARD GRANVILLE (1862-). An English Oriental scholar, born at Uley. He was educated at Pembroke College, Cambridge, studied medicine, but never practiced, and in 1887-88 traveled through Persia. In 1887 he became a fellow of Pembroke College, Cambridge, and in 1888 lecturer in Persian at the university, while in 1902 he was appointed Sir Thomas Adams professor of Arabic. His publications include: *A Year among the Persians* (1893); a catalogue of the Persian manuscripts contained in the university library at Cambridge (1896); a translation from the Persian, *A Traveler's Narrative, Written to Illustrate the Episode of the Báb*, with Persian text and notes (1891); *A Literary History of Persia* (2 vols., 1902-06); editions of Douletschah's *Tadhkiratu 'sh-Shu'ara* ('Memoirs of the poets') (1901); Muhammed Awfi's *Lubabu'l 'Albab* (1903); and a translation of Ibn Isfandiyyar's *History of Tabaristan* (1905); *Brief Narrative of Recent Events in Persia* (1909); *The Persian Revolution of 1905-09* (1910).

BROWNE, EDWARD HAROLD (1811-91). An English Bishop. He was educated at Cambridge, was vice principal of St. David's, in Wales, in 1843-49, and was professor of divinity at Cambridge from 1854 to 1864, when he was consecrated Bishop of Ely. He was transferred to Winchester in 1873, but resigned in 1890. He was a Broad Churchman, but conservative in Old Testament criticism. He wrote *An Exposition of the Thirty-nine Articles* (2 vols., 1850-53) and *Sermons on the Atonement and Other Subjects* (1859). Consult the memoir (London, 1895) by Kitchin.

BROWNE, FRANCIS FISHER (1843-1913). An American editor, poet, and critic. He was born at South Halifax, Vt., Dec. 1, 1843. After a high-school education Browne enlisted in the Forty-sixth Massachusetts Volunteers (1862-63); then studied law at Rochester and Ann

Arbor; edited the *Lakeside Monthly* (Chicago, 1869-74), *The Alliance* (1878-79), and *The Dial* (1880-1913), a semimonthly literary review that has maintained a very high critical standard. He wrote *Every-Day Life of Abraham Lincoln* (1886; new ed., 1913), *Volunteer Grain* (1896), and edited several anthologies, among which may be mentioned *Bugle Echoes* (1886), a collection of poems evoked by the Civil War.

BROWNE, GEORGE, COUNT DE (1698-1792). An Irish soldier, born in Limerick. His elder brother Ulysses entered the Austrian army, married the Countess von Martinitz, and was the father of the great field marshal, Maximilian Ulysses, Count von Browne (q.v.). The younger brother, after five years in the army of the Elector Palatine, entered the military service of Russia in 1730, became a general, and was captured by the Turks. After his release he fought in the Swedish War as major general, and in the Seven Years' War as lieutenant general. At Kolin and at Zorndorf he greatly aided the Allies. Under Peter III he became a field marshal, commander in the Danish War, and Governor of Livonia.

BROWNE, HABLOT KNIGHT (1815-82). An English illustrator and caricaturist, generally known as "Phiz." He was born at Kensington, and studied engraving with William Finden in London and water color in the art school of St. Martin's Lane. He began in 1836 his association with Charles Dickens, whose works he illustrated in a sympathetic but independent manner. From the author he received only a verbal description of the desired illustrations, which were often designed whilst the text was being written. His rendition of some of Dickens's characters surpassed the conceptions of the author himself. His best illustrations of Dickens's works were those for *Pickwick Papers*, *Dombey and Son*, *Martin Chuzzlewit*, *Bleak House*, *A Tale of Two Cities*. He adopted the name "Phiz" as a sort of correlate of Dickens's pseudonym "Boz." Subsequently he illustrated other books such as the works of Charles Lever and Ainsworth. In his early and again in his late career he contributed to *Punch*. He employed his leisure time with historic paintings which were defective in technique and in water color. In 1867 he was stricken with paralysis, which greatly impaired and finally terminated his artistic activities. The British Museum possesses a comprehensive collection of his drawings and water colors. Consult Kitton, *Phiz, a Memoir* (London, 1882); Thomson, *Life and Labors of H. K. Browne* (London, 1884).

BROWNE, ISAAC HAWKINS (1705-60). An English poet. He was born at Burton-on-Trent, Stafford; was educated at Trinity College, Cambridge; studied law, but did not practice; and in 1744 and 1747 was elected as a Whig to the House of Commons, where, said Dr. Johnson, he "never opened his mouth," although a famous wit, especially in his cups. *A Pipe of Tobacco* (1736) contains brilliant parodies of Pope, Swift, Cibber, Ambrose Philips, Thomson, and Young, respectively. Of his Latin poem, *De Animi Immortalitate* (1754), an English translation by Soame Jenyns is in vol. ii of Jenyns's works (1793).

BROWNE, JOHN ROSS (1817-75). An American traveler and author. He was born in Ireland, but when a child emigrated with his parents to Kentucky. At the age of 18 he went down the Mississippi on a flatboat, and for some

time was reporter of the Louisiana Senate. Next he shipped on a whaler, and upon his return published a book of observation on Zanzibar. He was for a time in the revenue service in California, where he reported the sessions of the first State Constitutional Convention. In 1851 he went as correspondent of a newspaper to Europe, visiting Italy, Sicily, and Palestine, and giving an account of his travels in *Yusef* (1853). He subsequently visited Algeria, Iceland, Poland, and Russia, and published: *Etchings of a Whaling Cruise* (1846); *The Land of Thor* (1866); *An American Family in Germany* (1867). In 1869 he made an elaborate report on the *Resources of the Pacific Slope*. He was Minister to China in 1868-69.

BROWNE, JUNIUS HENRI (1833-1902). An American journalist, well known as one of the correspondents of the *New York Tribune* during the Civil War. He was born at Seneca Falls, N. Y., was educated at St. Xavier College, Cincinnati, Ohio, and for some time was engaged in journalism there. At the outbreak of the Civil War he was sent, as "war correspondent" of the *New York Tribune*, to report the campaigns in the Southwest, but in May, 1863, was captured near Vicksburg by the Confederates, and for two years thereafter was confined successively in the Vicksburg, Jackson, Atlanta, Richmond, and Salisbury prisons. He escaped from Salisbury in December, 1864, with several companions, accomplished the difficult feat of crossing the mountains in midwinter, and after a journey of 400 miles reached the Federal lines at Knoxville. Soon afterward he published a book of war experiences, entitled *Four Years in Secession* (1865), which contains much interesting information, especially concerning the conditions which obtained in Southern prisons and the life of the Federal soldiers confined in them. After the war, and until his death, Browne was engaged as a "general writer," and contributed to many papers and periodicals in the United States. He also published *The Great Metropolis: A Mirror of New York* (1869) and *Lights and Sensations in Europe* (1872).

BROWNE, MAXIMILIAN ULYSSES, COUNT VON (1705-57). An Austrian field marshal, son of an expatriated Irish Jacobite. He was born in Basel, entered the Austrian service in 1717, and after fighting against the Turks (1737-39), served in Silesia. He commanded the right wing against Frederick the Great at the battle of Mollwitz (1741), where Frederick won his first victory in the Silesian War. During the Seven Years' War he was again defeated by Frederick at Lobositz (1756), and at Prague, where he was mortally wounded. Count von Browne was one of the most distinguished field marshals in the army of Maria Theresa. Frederick the Great was wont to speak of him as his "teacher in the art of war."

BROWNE, ROBERT (c.1550-c.1633). An English clergyman, forerunner of the Independents, or Congregationalists, and the earliest post-Reformation seceder from the Church of England. He was born at Toilethorpe, Rutlandshire, and educated at Cambridge. He then went to London, where he preached in the open air. Returning to Cambridge, he grew more radical in his views of church organization, and preached where he pleased, without troubling to obtain the bishop's license. In 1580 he formed a separatist congregation at Norwich. Coming thus more than once into conflict with

the law, he emigrated in 1581, with his friends, to Middleburg, in Zeeland, where he published several controversial books, including *A Treatise of Reformation Without Tarrying for Anie*, and *A Booke which Sheweth the Life and Manners of All True Christians*. Browne's difficult temper, however, led to dissensions and ultimately to the breaking up of the congregation. He went to Scotland in 1583 and assailed the established Presbyterian order there with his usual vigor; returned to England in 1584, and was again imprisoned for several months. He said later that he had been imprisoned 32 times. At last, broken and discouraged, he ceased to preach nonconformity, and settled down to be master of Stamford Grammar School for five years, and rector of Achurch, Northamptonshire, from 1591 to the day of his death, which occurred, probably in 1633, in Northampton jail, his last imprisonment arising from his having struck a constable in a fit of passion. For the views adopted by those who followed his early teachings, see BROWNISTS; CONGREGATIONALISM; and consult Dexter, *Congregationalism of the Last Three Hundred Years* (New York, 1880), which contains a careful account of Browne's career; also Burrage, *The "Retraction" of Robert Browne* (London, 1907).

BROWNE, SIR THOMAS (1605-82). An English philosopher and miscellaneous author. He was born in London, studied at Winchester, graduated in 1626 at Broadgate Hall (now Pembroke College), Oxford, and traveled through France to Italy, where he attended lectures in the universities of Padua and Montpellier. Returning thence through Holland, he was made doctor of medicine by the University of Leyden in 1633. He set up as practitioner at Norwich in 1637 and soon attained to a very considerable professional repute. Though Royalist in sympathy, he pursued his researches in quiet indifference to the stirring events of the Civil War. His learning was both multifarious and extensive. He spoke six languages, knew thoroughly philosophies ancient and modern, and was versed in astronomy, ornithology, and botany, as those sciences then existed. In general literature he was obviously well read, his quotation from the *Inferno*, for example, showing him to have been of the few who were then familiar with Dante. Of the four works published during his lifetime, the most famous and best are the *Religio Medici* (first authorized and correct ed., 1643), and the *Hydriotaphia, or Urn-Burial* (1658). The former was translated into Latin by John Merryweather (1644), and this version in one year passed through two Dutch and two French editions. It was subsequently rendered into French, German, and Dutch. The latter discusses the burial usages at various times and places, and closes with a chapter which for lofty and sustained eloquence must stand almost unequalled in English literature. The *Pseudodoxia Epidemica, or Enquiries into . . . Vulgar and Common Errors* (1646), is a mixture of cleverness and credulity, science and superstition, quite worthy of Pliny the Elder. The *Garden of Cyrus* (1658) contains some entertaining fantasies. A style more individual than Browne's was never written. Latin in derivation, it coins words with an ease permitted only while language is yet plastic, and its periods move with a majestic solemnity. Charles Lamb, who owed much of his own diction and viewpoint to Browne, speaks of Sir Thomas's "beautiful obliquities." The best edi-

tion of Browne's works is that by Simon Wilkin (4 vols., London, 1835-36), which includes all the posthumous publications, together with correspondence and other new matter. The reprint of 1852 (3 vols., London) is abridged and otherwise inferior. There is also an edition (1881) by Dr. Greenhill of the *Religio Medici*. Consult the fine essay on Browne in Pater, *Appreciations* (London, 1889), and Gosse, *Sir Thomas Browne* (London, 1905). Browne's *Notes and Letters* (incomplete) were edited by Southwell (1902). Consult also More, *Shelburne Essays*, ser. 6 (New York, 1909); Saintsbury, "Antiquaries," in *Cambridge History of English Literature*, vol. vii, pp. 232-258 (Cambridge, 1907-13); Whibley, *Essays in Biography* (London, 1913).

BROWNE, WILLIAM (1591-1643). An English poet. He was born in Tavistock, Devon, and hence is usually called "of Tavistock," was in Exeter College, Oxford, and was a tutor to Robert Dormer, afterward Earl of Carnarvon. He was a pupil of Drayton, and wrote *Britannia's Pastorals* (1613; second book, 1616) and *The Shepherd's Pipe* (1614; with Christopher Brooke, John Davies, and George Wither). Milton and Keats studied Browne's pastorals, which are differentiated from Spenser's by their delineation of Devon country life. His *Inner Temple Masque* was published in 1772, and a third book of *Pastorals* in 1852. The epitaph of the Countess Dowager of Pembroke (d. 1621), attributed to Ben Jonson, is by Browne. He used pure *ottava rima* to good effect. Consult the edition by Hazlitt (London, 1868); and Bullen's introduction in the edition (*ib.*, 1894) by Goodwin.

BROWNELL, broun'el or brou-nél, HENRY HOWARD (1820-72). An American poet and historian, born in Providence, R. I., Feb. 6, 1820. He was graduated from Trinity College, Hartford, in 1841, studied law, and was admitted to the bar, but settled as a teacher in Hartford. He published in 1847 a volume of *Poems*, and in 1851 the *People's Book of Ancient and Modern History*, and followed this in 1863 with *The Discoverers, Pioneers, and Settlers of North and South America*. But Brownell first attracted general attention by poems written during the Civil War. The earliest of these was a stirring version of the "General Orders" given by Admiral Farragut at the attack on the defenses of New Orleans. This led to his becoming attached to Admiral Farragut as private secretary. He was present at the naval battle in Mobile Bay, and after the war accompanied the Admiral on his European cruise. His best poems, "The River Fight" and "The Bay Fight" deal with the naval actions at New Orleans and Mobile. He collected his war poems in *Lyrics of a Day; or, Newspaper Poetry by a Volunteer in the United States Service* (1864). A selection of his *Poems*, revised by himself, appeared in 1866. His was among the most popular battle-poetry produced in the North during the Civil War; but his work is unfinished, uneven, often undignified, and sometimes grotesque. At its best, however, it sounds the lyric cry of a great national emotion. There is an appreciative essay on Brownell, by O. W. Holmes, entitled "Our Battle Laureate."

BROWNELL, WILLIAM CRARY (1851-). An American essayist and art critic, born in New York. He graduated at Amherst and was for two years art critic of the *Nation* (New York). From 1890 he was a literary adviser of Charles Scribner's Sons. His published volumes are:

French Traits, an essay in comparative criticism (1889); *French Art*, classic and contemporary painting and sculpture (1892); *Newport* (1896); *Victorian Prose Masters* (1901); *American Prose Masters* (1909). His treatment of French life was recognized as remarkably subtle and sympathetic, and of French art as very suggestive from a nonprofessional standpoint. His studies of the later English prose writers have been highly and deservedly praised. He was elected to the American Academy of Arts and Letters.

BROWN HEMATITE. See LIMONITE.

BROWN HILLS. A mining town in Staffordshire, England, about 9 miles east of Wolverhampton. It has iron foundries and collieries. Pop., 1891, 11,820; 1901, 15,262; 1911, 16,852.

BROWNIAN MOVEMENTS (discovered by the Scotch botanist, Dr. Robert Brown). The motion of very minute particles suspended in a fluid when seen through the microscope, often mistaken for motions of living matter. The cause of the movements has not been satisfactorily shown, but it has been surmised that heat is the motive power. Consult: Carpenter, *The Microscope and its Revelations*, 8th ed. by Dalinger (Philadelphia, 1901); Perrin, *Die Brown'sche Bewegung und die wahre Existenz der Moleküle* (Dresden, 1910); Swedberg, *Die Existenz der Moleküle* (Leipzig, 1912).

BROWNIE (Scotch, from his supposed brown color). In the old popular superstitions of Scotland, a good-natured and invisible goblin who attached himself to farmhouses and other country dwellings, and, while the inmates were asleep, performed their labors, such as churning and threshing. In Cornwall a similar brownie was evoked to assist at the swarming of bees. The resemblance to the Robin Goodfellow (q.v.) of the English and the Kobold of the Germans is conspicuous, while the Roman Lar is also suggested by this superstition.

BROWNING, ELIZABETH BARRETT (1806-61). An English poet. She was the eldest daughter of Edward Moulton, or Moulton-Barrett, as he afterward wrote his name, and Mary Graham, and was born at Coxhoe Hall, 5 miles from the city of Durham, March 6, 1806. In 1809 the family settled in Herefordshire, among the Malvern Hills. Elizabeth early displayed great precocity, eagerly read books beyond the comprehension of most children, and when about 11 years old, composed an "epic poem," "The Battle of Marathon," an echo of Pope's *Iliad*. Taking up the study of the classics in the original, she read widely in Greek literature. In 1826 she published anonymously *An Essay on Mind and Other Poems*. In 1832 the family removed to Sidmouth, and three years later to London, where Miss Barrett established her reputation by *The Seraphim and Other Poems* (1838). The bursting of a blood vessel in the lungs, added to the shock caused by the death, in 1840, of a favorite brother, endangered her life, and for seven years she was confined to her room; but even here she resumed her labors, and in 1844 published *Poems*, including "The Cry of the Children," and "Lady Geraldine's Courtship," in which she praised Robert Browning's verse. On May 20, 1845, she first met him, and on Sept. 12, 1846, they were married against her father's wishes. Proceeding to Italy, they made Florence their home and there in 1849 a son was born, Robert Wiedemann Barrett, who became known as an artist and a poet. In 1850

appeared a collected edition of Mrs. Browning's poems, with revisions and omissions, containing also a new translation of the *Prometheus Bound*, and in 1856 *Aurora Leigh*, a romance, partly autobiographical, in blank verse. *Casa Guidi Windows* (1851) and *Poems before Congress* (1860), were inspired by her ardent sympathy with the movement to free Italy. By this time her health had begun to fail, and on June 29, 1861, she died. In 1862 Mr. Browning published a volume of verses by his wife, *Last Poems*; in 1863 her *Greek Christian Poets and the English Poets*, essays and translations originally written for the *Athenæum*, and in 1866 *Selections from the Poems of Elizabeth Barrett Browning* (2d series, 1880). The married life of these brilliant poets was singularly happy, and their mutual influence is clearly seen in their verse. Indeed, it has been questioned by some eminent critics whether Mrs. Browning was not more truly a poet and more imbued with the genuine ardor of lyric poetry than even her distinguished husband. Mrs. Browning was slight in figure, had brilliant eyes, and an expressive face, was deeply spiritual, as all her writings show, fascinating in conversation, and erudite without being pedantic. Composing with great ease, she often employed false metres and fell into affectations, but it was well said of her that her diction was "at times sublime, and always musical and beautiful." The *Sonnets from the Portuguese*, which were in reality original compositions, written after her engagement to Mr. Browning (privately printed in 1847 and included in the volume of 1850), are unrivaled, of their kind, in the English language as an exquisite expression of pure yet passionate love. Consult: Ingram, *Elizabeth Barrett Browning* (Boston, 1888); Bayne, *Two Great Englishwomen* (London, 1881); *Letters of E. B. Browning*, edited by Kenyon (London and New York, 1897); *Letters of R. Browning and E. Barrett* (London and New York, 1899); Lilian Whiting, *Study of Elizabeth Barrett Browning* (Boston, 1899); *Letters to R. H. Horne*, edited by Stoddard (New York, 1877); P. Lubbock, *E. B. Browning in her Letters* (London, 1906); G. M. Merlette, *La Vie et l'œuvre d'Elizabeth Browning* (Paris, 1906); Lilian Whiting, *The Brownings: Their Life and Art* (1911); Fleckenstein, *Die literarischen Anschauungen und Kritiken Elizabeth Barrett Browning* (Heidelberg, 1913). See also BROWNING, ROBERT, *Bibliography*.

BROWNING, ORVILLE HICKMAN (1810-81). An American politician. He was born in Kentucky, but removed to Illinois and helped Abraham Lincoln organize the Republican party in that State. He served in both Houses of the State Legislature, was United States Senator (1861-63), Secretary of the Interior (1866-68), and acting Attorney-General of the United States (1868-69).

BROWNING, OSCAR (1837-1923). An English author, born in London. He was educated at Eton and at King's College, Cambridge, graduating in 1860 with classical honors. From 1860 to 1875 he was a master at Eton and then returned to Cambridge, where he has since been lecturer in history and political science. As principal of the University Training College for teachers he has also performed valuable service. He was twice defeated as a Liberal candidate for Parliament. Of his numerous publications in history, biography, and education, may be cited: *The Netherlands in the Sixteenth Century*

(1869); *Thirty Years' War* (1870); *Modern England* (1879); *History of Educational Theories* (1881); *England and Napoleon in 1803* (1889); *History of England* (4 vols., 1890); *Life of George Eliot* (1890); *Dante: His Life and Works* (1891); *Life of Peter the Great* (1898); *Wars of the Nineteenth Century* (1899); *History of Europe, 1814-1843* (1901); *Napoleon: The First Phase* (1905); *The Fall of Napoleon* (1907); *A History of the Modern World, 1815-1910* (London, 1912).

BROWNING, ROBERT (1812-89). An English poet, distinguished for his original and subtle thought. He was born in Camberwell, a suburb of London, May 7, 1812. His father, Robert, was a clerk in the Bank of England, and his mother, Sarah Anne, the daughter of a Hamburg shipowner named Wiedemann, settled in Dundee. The father was a good classical scholar, a lover of old books, and a ready versifier. The mother, who had some musical talent, was of an exalted and lovely character. Both parents were Dissenters; and Browning never quite escaped from the consequences of his early religious training, although in one direction he permitted himself great breadth of speculation. Cardinal Wiseman, indeed, reviewing *Men and Women* in 1856, detected "beneath the surface an undercurrent of thought that is by no means inconsistent with our religion." The future poet had a happy childhood, encouraged by his father and mother in his refined tastes, and learning less from his school than from them and from the books they placed in his way. Among these was Pope's *Iliad*, which he read and liked at the age of eight. But his first master was really Byron, under whose influence he had written by 1824 enough poems to form a volume. Fortunately, this failed to find a publisher, for the next year the works of Shelley and Keats came into his hands, and, by revealing the possibilities of poetry, dissipated his youthful ideals and quickened his own development. After leaving school, Browning studied under a tutor, then attended a few lectures at University College, London, deciding to complete his education by travel on the Continent and a more intimate acquaintance with foreign literature. His sympathetic father had left him free to choose his life work, and although he was at this time known as an artist and musician rather than a writer, evidently he had long felt a stronger inclination in the direction of authorship; and an early desire to produce a series of monodramatic epics illustrating the life of typical souls now revived itself urgently. Early in January, 1833, he put forth anonymously his first book, *Pauline*, written the year before; a poem immature as a whole, but abounding in passages of great beauty. He spent the winter of 1833-34 in Russia. In 1835 he published a metaphysical drama, entitled *Paracelsus*, which was hailed by John Forster as a work of genius and secured for Browning the friendship of Macready the actor, to whom he dedicated the historical drama *Stratford* (1837). From this time on until his marriage Browning lived mostly in London and its neighborhood, studying life, nature, and books, though in 1838 he visited Italy. In 1840 he published *Sordello*, a narrative poem, which his really dramatic genius made very obscure. The period 1841-46 was well filled by a series of poems published in eight numbers, bearing the collective title *Bells and Pomegranates*, and beginning with *Pippa Passes*, a lyrical drama showing the power of

unconscious influence, which received warm praise from Miss Barrett, afterward Mrs. Browning. This remarkable group embraced the plays *King Victor and King Charles* (1842); *The Return of the Druses* (1843); *Colombe's Birthday* (1844), successfully acted in 1853; the tragedy *A Blot in the 'Scutcheon* (1843), produced at Drury Lane that same year; *Dramatic Lyrics* (1842), among them "Cavalier Tunes" and "The Pied Piper of Hamelin"; *Dramatic Romances and Lyrics* (1845), including "How They Brought the Good News," "A Lost Leader," and "The Flight of the Duchess"; and closed with *A Soul's Tragedy* (1846), a work of tremendous power. In 1846 Browning was married to Elizabeth Barrett, and after that date resided in Italy, spending with his wife some months in England and Paris, 1851-52, and in Normandy, 1858, and returning to England to educate his son after Mrs. Browning's death in 1861. Before this sad termination of an ideal married life, Browning had published (1850) *Christmas Eve and Easter Day*, a poem defending catholicity in religion; and *Men and Women* (1855), including "Evelyn Hope," "Fra Lippo Lippi," and other now well-known poems. Then followed *Dramatis Personæ* (1864), containing "Gold Hair" and "Rabbi Ben Ezra"; *The Ring and the Book* (1868-69), an epic in 21,116 lines, dealing with the tyranny of the passions, and considered by many his masterpiece; *Balaustion's Adventure* (1871), including an English version of the *Alcestis* of Euripides; *Prince Hohenstiel Schwan-gau* (1871), a defense by the prince (Napoleon III) of the doctrine of expediency; *Fifine at the Fair* (1872), a powerful discussion of a question in morals; *Red Cotton Night-Cap Country* (1873), the story of a famous Norman law case; *Aristophanes's Apology* (1875), including a transcript from Euripides; *The Inn Album* (1875), a tragic story of betrayal and suicide; *Pacchiarotto and Other Poems* (1876); *The Agamemnon of Æschylus* (1877); *La Saisiaz* and *The Two Poets of Croisic* (1878), the former asserting his belief in a future life; *Dramatic Idyls* (1879-80); *Jocoseria* (1883), a number of narrative poems; *Ferishtah's Fancies* (1884); *Parleyings with Certain People of Importance in their Day* (1887), the characters serving as mouthpieces for the poet's opinions on literary, artistic, and philosophical questions; and *Asolando*, published in London on the day of Browning's death, which occurred in Venice, Dec. 12, 1889. He was buried in Westminster Abbey.

Browning was below the medium height, inclining to stoutness, with a ruddy complexion, large and bright gray eyes, fine features, a quickness of speech and gait, and a magnetic address which together with his liberal sympathy with humanity enabled him to mingle freely with all classes. His love for Italy was as deep and intelligent as that of his wife, and from that "land of lands" he drew the inspiration for many of his finest poems; though the fact that his grandfather was a German is recalled by his tendency to Hegelian philosophizing and by his questioning and speculative habit of mind, as well as by peculiarities of syntax and vocabulary.

What is called the obscurity of Browning's poetry is the characteristic that first strikes ordinary readers and in many cases discourages them from further study. It may be admitted that he was often careless of artistic and even of grammatical finish—that if it came to a

choice, he valued substance above form; but the obscurity is often more apparent than real, and, where it exists, springs usually from the marvelous richness and fullness of his thought, and from the rapidity of his mental process, which passes from point to point more swiftly than the average mind can follow, careless sometimes of making the connection clear. The effort, however, which is necessary to apprehend him is not only a valuable mental tonic, but is frequently rewarded by the discovery of real and satisfying thought. The vast erudition of the poet, and his habit of casual allusion to things met with in out-of-the-way parts of his wide reading, also contribute to the impression of obscurity; but these difficulties are not sufficient to prevent his recognition as being, in his double capacity of poet and thinker, one of the most powerful influences on the spiritual and mental life of our age. It is possible that the choice of a vehicle of expression which was forced upon him by the time of his birth was in some degree an unfortunate one. Had he lived in the age of Shakespeare (next to whom he has been ranked for insight into the springs of human character and action), his genius, which was essentially dramatic, might more naturally and adequately have expressed itself in the form which characterized that period; or had he begun to write half a century later than he did, after the development of the psychological novel, he would very possibly have chosen to express in prose the vast range of thought on whose utterance the limitations of metrical law have sometimes imposed burdensome restrictions.

But such speculations are less important than the recognition of the qualities which he actually possessed and which make him a vital force. Not least among them must be reckoned his unswerving optimism, at which Tennyson gravely shook his head, calling it "depressing," but which has been the inspiration of many another soul. He saw with the utmost clearness how eternally insoluble is "the riddle of the painful earth"; he was the last who would have delighted fatuously in the arrangements of this as the best of all possible worlds; yet to the end he could describe himself, in the epilogue of his last published book, as

"One who never doubted clouds would break,
Never dreamed, though right were worsted, wrong would
triumph;
Held, we fall to rise, are baffled to fight better,
Sleep to wake."

An inevitable comparison is suggested by the mention of Tennyson, whose name was generally, in their lifetime, coupled with Browning's. Their first books were published within six years of each other, and the relations between them were always of the utmost cordiality and friendliness, untouched by any suspicion of the jealousy which might have affected smaller minds. The contrast in their style was happily defined in the aphorism of Oliver Wendell Holmes: "Tennyson is the light meat, Browning the dark." The laureate had a smoothness, a finish, and a grace which Browning rarely displays, though he showed at times that he could attain it; but from the cloying sweetness of Tennyson's Vergilian verses many will turn to the more manly and satisfying, if more rugged, tone of the robust poet. The force of the first of these comparative epithets will be seen at once by recalling the attitude of the unsuccessful lovers in "Maud" and "Locksley Hall" on the

one side and "The Last Ride Together" on the other.

If the Romantic movement be taken to stand for the assertion of the individual, his rights and his liberties, against the conventional order of the centuries, then Browning was essentially a Romantic. Strongly influenced as he was in his early years by Shelley, he preached a similar gospel of freedom from all restraints that hinder the growth of natural character. It was the "life of typical souls" that he set himself to write; and always it is the typical soul that interests him—whether struggling to emerge from the confining bands of the mediæval system, or expanding amidst all the intricate complexities of modern life, which he loved precisely because it made the game harder to play and thus more of an intellectual exercise. Indeed, though he chose his subjects frequently from the bygone centuries, partly won by their picturesque quality and partly obeying the fashion of his time, even in the mediæval period it was always the character which he sought to reproduce rather than, like Rossetti, the environment. Typical souls, whether good or evil in the world's estimation; men or women indifferently (and that he could read the one as unerringly as the other needs no further witness than the poignant truth of his analysis of a woman's heart in the poem "In a Year")—these were his subjects, and in the life of those souls, eminent moments, as Dowden puts it—"moments when life, caught up out of the ways of custom and low levels of prudence, takes its guidance and inspiration from a sudden discovery of truth through some high ardor of the heart." Browning as a poet may most fitly be classed with George Meredith as a novelist and Wagner as a composer. Alike decried as obscure and unintelligible, they have all come to be recognized by the thoughtful as supreme; and they are alike in their power to satisfy the deepest intellectual cravings with a fullness which is utterly beyond the power of their more popular rivals. The Browning Society, established in London in 1881 (four years after Professor Corson had founded the Cornell Browning Club), and the similar organizations throughout England and the United States, have by their discussions and publications done much to advance the study of his works. The Browning Society of Philadelphia has the largest membership of any like organization in the world, numbering nearly 5000 persons, and holding its meetings in theatres and other very large buildings.

Bibliography. Only a few titles from the immense literature on Browning can be given here: *Browning Society Papers* (London, 1881-91); Berdoo, *Studies* (London, 1895); Orr, *Handbook* (New York, 1892); Porter and Clarke, *Browning Study Programmes* (New York, 1900); Cooke, *Browning Guide-Book* (New York, 1891); Nettleship, *Robert Browning: Essays and Thoughts* (London, 1890); Molineaux, *Browning Phrase-Book* (Boston, 1896); Little, *Essays* (London, 1899); Orr, *Life and Letters* (New York, 1891); Sharp, *Life* (London, 1890); Gosse, *Personalities* (New York, 1890); Vaughn, *Robert Browning* (London, 1900); Brooke, *The Poetry of Robert Browning* (London, 1903); E. Dowden, *Robert Browning* (London, 1904); C. H. Herford, *Robert Browning* (New York, 1905); Griffiths, *Early Friends of Robert Browning* (London, 1905); Chesterton, *Browning* (1908);

Curry, *Browning and the Dramatic Monologue* (Boston, 1908); Cunliffe, *Elizabeth Barrett's Influence on Browning's Poetry* (Cambridge, 1908); Henry James in his *Views and Reviews* (Boston, 1908); Clarke, *The Great Twin Brothers: Tennyson and Browning* (Boston, 1910); Figgis, *Robert Browning* (London, 1902); Clarke, *Browning and His Century* (New York, 1912); H. Jones, *Browning as a Philosophical and Religious Teacher* (6th ed., 1913); Treves, *The Country of "The Ring and the Book"* (London, 1913). See also BROWNING, ELIZABETH BARRETT.

BROWNISTS. A name current in England towards the end of the sixteenth century and applied indiscriminately to all seceders from the Established church, among whom Robert Browne (q.v.) was especially prominent. His writings (1582-83) were widely read and did much to foster those principles upon which the Separatist churches of England and Holland and the later Independent and Congregational churches of England and America were founded, but the extreme independency he advocated, together with his illiberality, was so distasteful, and his return to the Church of England was regarded as such a disgraceful relapse, that, in general, the Separatists repudiated the appellation of "Brownists" as inappropriate and slanderous.

BROWN, JONES, AND ROBINSON, THE ADVENTURES OF. A series of humorous sketches, with explanatory notes, by Richard Doyle, the English caricaturist. Many of them appeared in the London *Punch*; but they were later completed for Bradbury and Evans, who published them in 1854. They deal with the mishaps of three middle-class citizens of London—one tall, one short, one fat—on their travels at home and abroad.

BROWNLEE, WILLIAM CRAIG (1784-1860). An American clergyman. He was born in Torfoot, Lanarkshire, Scotland, and studied at the University of Glasgow. After holding several pastorates in Pennsylvania and New Jersey, he became professor of Latin and Greek at Rutgers College in 1825. In the following year he was installed as one of the ministers of the Collegiate Reformed Dutch church in New York City. He edited the *Dutch Church Magazine* (4 vols.) and published a number of independent works, among which are: *Inquiry into the Principles of the Quakers* (1824); *The Christian Youth's Book* (1844); *Treatise on Popery* (1847); *Lights and Shadows of Christian Life* (1847).

BROWNLOW, WILLIAM GANNAWAY (1805-77). An American journalist, born in Wythe Co., Va. He learned the trade of a carpenter, but in 1826 became a Methodist minister and was for 10 years an itinerant. He took an active part in politics and advocated the reelection of Adams in 1828. In 1839 he was editor of the *Knowville Whig*, and his bold and quaint utterances soon gave him a wide reputation and gained him the nickname of "the fighting parson." Though a strong advocate of slavery, he vigorously opposed secession on the ground that the South could best preserve her institutions by remaining in the Union. For this reason his paper was suppressed, and he himself was first arrested and later sent into the Federal lines. He returned to Tennessee in 1864, was elected Governor in 1865, and in 1869 was sent to the United States Senate, where he re-

mained until 1875. He had sold the *Whig* in 1869, but bought a controlling interest in it again in 1875. He published: *The Iron Wheel Examined* (1856), a reply to attacks on the Methodist church; *Ought American Slavery to Be Perpetuated?* (1858); *Sketches of the Rise, Progress, and Decline of Secession, with a Narrative of Personal Adventures among the Rebels* (1862).

BROWN ORE. A general name given to those iron ores which consist chiefly of limonite or other hydrous oxides of iron. See LIMONITE.

BROWN RIGG PAPERS. The title of a series of sketches by Douglas Jerrold (1860).

BROWN-SÉQUARD, -sà'kär', CHARLES EDOUARD (1818-94). A French-American neurologist and physiologist, born in Mauritius. His father, Edward Brown, was a native of Philadelphia; his mother was French and was named Séquard. He took the degree of M.D. in Paris, 1840, and afterward spent much of his time in America, investigating and lecturing. His contributions to our knowledge of blood and animal heat, as well as of the spinal cord and the nervous system, were of the highest importance. He was the first to demonstrate that the decussation of the sensory conductors is in the cord itself. From 1864 to 1868 Dr. Brown-Séquard was professor of physiology and pathology of the nervous system in Harvard University. Returning to France in 1869, he was appointed professor of experimental and comparative physiology in Paris. He was founder and editor of the *Journal de la Physiologie de l'Homme et des Animaux* from 1858 to 1863. He established *Archives de la Physiologie Normale et Pathologique* in 1869. From 1873 to 1878 he practiced medicine in New York, and with Dr. E. C. Seguin published the *Archives of Scientific and Practical Medicine*. In 1878 he succeeded Claude Bernard as professor of experimental medicine at the Collège de France. He published *Lectures on the Diagnosis and Treatment of the Principal Forms of Paralysis of the Lower Extremities* (1861). In 1889, at the age of 71, after a series of experiments upon himself and unfortunately for his reputation, he advocated as a means of prolonging and invigorating human life the hypodermic injection of a fluid in which the testicles of sheep had been macerated—the "Brown-Séquard Elixir." Consult Berthelot, "Notice sur la vie et les travaux de M. Brown-Séquard" (Institut de France, *Académie d. sci. Mémoires*, vol. 47, pp. ccxix-cclviii, Paris, 1904).

BROWNSON, ORESTES AUGUSTUS (1803-76). An American theologian and author. He was born in Stockbridge, Vt., and was brought up as a Presbyterian, but became a Universalist preacher. In 1828 he went into politics and tried to establish a Workingmen's party in New York, moved thereto by the ideas of Robert Owen. In 1832 he was enthusiastic over Dr. Channing and became a Unitarian preacher. In 1836 he organized in Boston "The Society of Christian Progress" as a church, of which he was pastor. At this period, also, Brownson was one of the New England Transcendentalists and published *New Views of Christianity, Society, and the Church*, which was a moderate attack on Protestantism. In 1838 he started the *Boston Quarterly Review*, which had existence for about five years, and was then merged in the New York *Democratic Review*, and from 1844 was known as *Brownson's Quarterly Review*.

This was written throughout almost entirely by Brownson himself. In 1840 he published *Charles Elwood: or, The Infidel Converted*, a treatise, in the form of a story, in favor of the Roman Catholic church, towards which the author was drifting, and which he joined in 1844. He was a vigorous and indefatigable writer in support of whatever belief he for the time adopted. A deeply spiritual man, he gained a reputation as a philosopher and a powerful Catholic apologist, in spite of his frequent conflicts with the Church authorities. His most important writings, in addition to those mentioned above, are: *The Convert: or, Leaves from my Experience* (1857); *The American Republic: Its Constitution, Tendencies, and Destiny* (1870). His *Works* have been republished by his son, H. F. Brownson, in 20 vols. (1882-1907). The latter has also published a *Life*, in 3 vols. (1898-1900). *Watchwords from Dr. Brownson* was edited by J. S. O'Neil in 1910.

BROWN SPAR. A name popularly given to certain varieties of mineral carbonates that are colored brown, on account of the presence of iron oxide, especially *ankerite*, *dolomite*, *magnesite*, and *siderite*.

BROWNSTONE. A term originally applied to a variety of sandstone, of reddish-brown color, used extensively as a building material, but now also used for sandstones occurring in the same formation, of similar physical character, but not always brown color. The brownstones of Connecticut and New Jersey, which belong to the Triassic system, are heavily bedded, impure sandstones, rather soft when first removed from the quarries, but hardening with exposure to the air. They were much employed at one time in New York and other Eastern cities, but in recent years they have been largely superseded in public favor by granite and limestone. See BUILDING STONE.

BROWN'S TRACT. A tract of land containing about 200,000 acres, situated in the Adirondack Mountain region, in northern New York, extending across Herkimer County into Hamilton County on the east, and into Lewis County on the west. It was purchased by John Brown, a patron of Brown University, from Alexander McComb. The tract is magnificently wooded.

BROWNSVILLE. A city and the county seat of Haywood Co., Tenn., 57 miles by rail northeast of Memphis, on the Louisville and Nashville Railroad (Map: Tennessee, A 3). It is in a fertile region, adapted to stock raising and fruit and lumber growing, and to the cultivation of cotton, which forms the staple of its trade and manufactures; and has a cottonseed oil mill, a compress, and an anise factory. Brownsville is the seat of the Brownsville Training School for Boys, established in 1900, and has a Carnegie library. The water works are owned by the city. Pop., 1890, 2516; 1900, 2645; 1910, 2882.

BROWNSVILLE. A city, port of entry, and the county seat of Cameron Co., Tex., opposite Matamoros, Mexico, on the Rio Grande, and on the Rio Grande and the St. Louis, Brownsville, and Mexico railroads (Map: Texas, D 7). Noteworthy features include the courthouse, a United States customhouse, a hospital, a library, a fine country club, a Roman Catholic college and a convent, and the Roman Catholic cathedral. The products of farming and stock raising constitute a consider-

able part of the city's trade. There is also a large sugar mill. Near by, at Point Isabel, the government has erected a large wireless station. (See WIRELESS TELEGRAPHY.) Settled in 1848, Brownsville was incorporated in 1853 and is governed under the charter of 1875, which provides for a mayor, elected biennially, and a council. The city owns its water works, electric light plant, and street railway. The battle of Resaca de la Palma (q.v.) was fought near by, on May 9, 1846, and the town was taken by Mexican raiders under Cortina, on Sept. 28, 1859. On the night of Aug. 13, 1906, a shooting affray occurred, which was attributed to a negro regiment at Fort Brown. Failing to detect the particular offenders, President Roosevelt dismissed an entire battalion, which action occasioned heated debates in Congress and in the public press. Pop., 1900, 6305; 1910, 10,517; 1920, 11,791. Consult *Brownsville Court of Inquiry Report* (Washington, D. C., 1911).

BROWN SWISS CATTLE. A breed of dairy cattle, most highly developed in the Canton of Schwyz, Switzerland, and introduced into the United States in 1869. It is one of the two principal breeds in Switzerland and is growing in numbers and favor elsewhere. See CATTLE.

BROWN UNIVERSITY. One of the oldest institutions of learning in the United States, situated in Providence, R. I. The charter of the university was granted by the General Assembly of Rhode Island in 1764, and instruction was begun in Warren in 1765. The inception of the university was mainly due to discriminations made against Baptist students in existing American colleges and to the consequent desire of the Baptists for a college under their own control. Under the initiative of the Philadelphia Baptist Association, Rhode Island was chosen as the home of the new college, since that Colony was Baptist "in origin and popular attachment" and also recognized "absolute religious liberty." The charter of the university provided for a corporation of 12 fellows and 36 trustees; 8 of the fellows, including the president, to be Baptists, and the other 4 of any denomination; and 22 of the trustees to be Baptists, and the remaining 14 of other specified Protestant denominations. The charter also enacted that "religious tests" should "never be admitted," but that all the members thereof should "enjoy full, free, absolute, and uninterrupted liberty of conscience."

The first president of the college was the Rev James Manning, a Princeton graduate. He established a Latin school in Warren preparatory to the beginning of collegiate instruction, and in 1770 this school was removed, together with the college, to Providence, where until recent years it has existed as the University Grammar School. In the spring of 1770 the foundations of the first permanent college building, the present University Hall, were laid. In 1804 the name of the college was changed from Rhode Island College to Brown University in honor of Nicholas Brown, of the class of 1786, who gave liberally to the college. The growth of the university was gradual until the election of its fourth president, the Rev. Francis Wayland, in 1827. In the 28 years of his administration President Wayland brought about an entire reorganization and a great expansion in the scope of the work of the university. The elective principle was recognized; sciences were introduced and made prominent in the curriculum;

the permanent funds were largely augmented, and the influence and intellectual prestige of the institution were raised. With the accession to the presidency in 1889 of the Rev. Elisha Benjamin Andrews, a graduate of the class of 1870, the modern life of the university, properly speaking, began. During his term of office the number of undergraduate students increased from 268 to 864, and of graduate students from 3 to 101; all scholastic departments, and especially those in the humanities, were much enlarged, and in October, 1891, the Women's College was founded. At first only the privilege of university examinations was granted, but in 1892 all the university degrees, and also the graduate courses, were opened to women, and in 1897 the institution was formally accepted by the corporation as the Women's College in Brown University, and its management vested in a dean, subject to the direction of the president of the university. The system of instruction is not coeducational, the Women's College having its own buildings and campus.

The university offers courses leading to the degrees of A.B., Ph.B., B.S. (civil, mechanical, or electrical engineering), A.M., Sc.M., and Ph.D. Candidates for the degrees of A.B. and Ph.B. are offered a large range of electives after the freshman year. For the more technical degree of B.S. no freedom of election is given, but certain cultural courses are included in the curriculum. Of recent years Brown has placed much emphasis upon graduate work. The income of 100 scholarships is available for needy undergraduate students; there are several fellowships for graduate students; and in addition there is a considerable loan fund.

The libraries of the university contain 225,000 volumes. They comprise the University Library, the John Carter Brown Library, and the departmental libraries. The main library, besides its general collection, contains about a dozen special libraries. The John Carter Brown Library, an unsurpassed collection of Americana, was presented to the university in 1901 with a liberal endowment fund. It is housed in a special building.

The equipment of the university includes 26 buildings, of which 6 are dormitories, and 8 wholly or in part recitation halls. The new John Hay Library was at the time of its erection the finest college library building in New England.

At the end of the academic year 1912-13 the endowment of the university amounted to \$4,276,994.68. In 1913-14 there were 90 professors and instructors and a student body of 966, of whom 90 were graduate students, 673 undergraduates, and 203 students in the women's college. In addition to the above, 360 students were enrolled in the extension courses.

The presidents have been: James Manning, 1762-91; Jonathan Maxcy, 1792-1802; Asa Messer, 1802-26; Francis Wayland, 1827-55; Barnas Sears, 1855-67; Alexis Caswell, 1868-72; Ezekiel G. Robinson, 1872-89; E. Benjamin Andrews, 1889-98; William Herbert Perry Faunce, 1899. Consult: Guild, *Life, Times, and Correspondence of James Manning, and the Early History of Brown University* (Boston, 1864); *Brown University, Annual Reports of President* (Providence, 1869 et seq.); Tolman, *History of Higher Education in Rhode Island* (Baltimore, 1891; Brown, and others, *Memories of Brown; Traditions and Recollections Gathered from Many Sources* (Providence, 1909).

BROWNWOOD. A city and the county seat of Brown Co., Tex., 140 miles southwest of Dallas; on Pecan Bayou, and on the Fort Worth and Rio Grande and the Gulf, Colorado, and Santa Fe railroads (Map: Texas, C 4). It is the seat of Howard Payne College (Baptist) and Daniel Baker College (Presbyterian) and has a fine government building and Carnegie library. The city has considerable trade in cotton, wheat, pecan nuts, and hides, and its industrial interests are represented by cotton gins, cottonseed oil and flour, creameries, brick factories, and machine shops. There are deposits of oil in the vicinity. Settled in 1866, Brownwood was incorporated in 1878. The government is administered under a charter of 1891, which provides for a mayor, elected biennially, and a city council. The water works are owned and operated by the municipality. Pop., 1900, 3965; 1910, 6967.

BROŽÍK, bró'zhék, VACZLAV (1851-1901). A Bohemian historical and genre painter. He was born in Třemošna, near Pilsen, and studied principally with Emil Lauffers in Prague, with Piloty in Munich, and under Bonnat in Paris. While in Paris he was much influenced by the historical painter Munkacsy (q.v.). The subjects of most of his works are taken from the history and legends of Bohemia. His canvases are usually large and crowded with figures in magnificent costumes, which do not always conceal their faulty anatomy. The chief interest of his paintings, which are deficient in the treatment of light and atmosphere, is their value as illustrations. He first won fame with his picture "Embassy of King Vladislav to the Court of Charles VII of France," now in the National Gallery, Berlin. Others of his works are "The Ballad Singer," "The Imperial Councilors Thrown out of the Window at Prague" (City Hall, Prague), "Infelix Austria Nube" (1897, Museum, Vienna), and "Columbus at the Court of Ferdinand and Isabella" (Metropolitan Museum, New York).

BRUANG, bróo-ang'. See *Sun Bear*, under BEAR.

BRUCE. A family illustrious in Scottish history, descended from Robert de Bruis, a Norman knight, who accompanied William the Conqueror to England in 1066, and died about 1094. His son, Robert, was a companion in arms of Prince David of Scotland, afterward David I, from whom he received a grant of the lordship of Annandale, held by military tenure. At the commencement of the war in England between Stephen of Blois and Matilda, niece of the King of Scots, Robert de Bruis adhered to the former and renounced his allegiance to David, resigning his lands in Annandale to his son Robert. In 1138 he was sent by the barons of the north of England to negotiate with David, who had advanced in support of his niece's claims as far as Northallerton, Yorkshire. In the battle of the Standard which followed, according to tradition, he took prisoner his son Robert, then 14 years of age, who, as Lord of Annandale, fought on the Scottish side. He died in 1141. His English estates were inherited by his eldest son, Adam, whose male line terminated in Peter Bruce, Constable of Scarborough, in 1271. Robert de Bruce, second Lord of Annandale, had two sons: Robert, who married a natural daughter of William the Lion and died without issue before 1191; and William, whose son, Robert, fourth Lord of Annandale, married Isabel, second

daughter of David, Earl of Huntingdon, brother of William the Lion, and thus laid the foundation of the royal house of Bruce. He died in 1245.

BRUCE, ALEXANDER BALMAIN (1831-99). A Scottish divine and author, born at Aberargie. He was educated at the University of Edinburgh and at the Divinity Hall of the Free church of Scotland. In 1859 he was called to Cardross and in 1868 to the Free church of Broughty Ferry in Forfarshire. In 1875 he was appointed professor of apologetics and New Testament exegesis in the Free Church Hall in Glasgow, a position which he filled with distinction till his death. Bruce was among the most distinguished biblical scholars of his time. His reputation was gained by his studies on the Gospels, entitled *The Training of the Twelve* (1871). On account of his views concerning inspiration contained in *The Kingdom of God; or, Christ's Teachings according to the Synoptic Gospels* (1889), he was severely criticised by the orthodox and received a slight censure from the General Assembly. Among his other books are: *The Humiliation of Christ* (Cunningham Lectures, 1876); *The Chief End of Revelation* (1881); *The Parabolic Teaching of Christ* (1882); *The Galilean Gospel* (1884); *The Miraculous Element in the Gospels* (1886); *Apologetics; or, the Cause of Christianity Defensively Stated* (1892); *With Open Face* (1896); *The Providential Order of the World* (1897); and *The Moral Order of the World* (1899). In conjunction with Canon T. K. Cheyne, he edited the *Theological Translation Library* (1894).

BRUCE, BLANCHE KESLO (1841-98). A negro politician of some note. He was born in slavery in Prince Edward Co., Va., but was educated with his master's son. He subsequently taught a school for negroes in Missouri and was able to take a partial course at Oberlin College. He then became a planter in Mississippi in 1869, entered heartily into the Reconstruction movement, and held several local offices, including that of county superintendent of education. Early in 1875 he was elected to the United States Senate as a Republican, and served one term, being the second negro to serve in this body. In 1881 President Garfield appointed him Register of the United States Treasury, a position which he held until 1885. President McKinley appointed him to the same office in 1897.

BRUCE, DAVID (1324-71). A king of Scotland, son of King Robert Bruce, whom he succeeded, in 1329, as David II. In accordance with the terms of the Treaty of Northampton, he had married, when four years old, Joanna, daughter of Edward II of England, and on Nov. 23, 1331, he was crowned with her at Scone. In 1333 the success of Edward Baliol (q.v.) and the English party obliged David's guardians to send him and his consort to France; but on the dispersion of Baliol's adherents David returned to Scotland, in 1341. He made unsuccessful inroads into England and in 1346 was taken prisoner at the battle of Neville's Cross, near Durham, and conveyed to the Tower of London. Thence he was removed to Odiham, in Hampshire, and not released till 1357, when his ransom was fixed at 100,000 marks. His Queen died in 1362, and he married Margaret Logie, a Scottish gentlewoman of singular beauty, whom he divorced in 1369. He had no issue, and in his later years he was engaged in several intrigues with England, with the view of excluding

his nephew, Robert, the Steward of Scotland and the next heir, from the throne. He died at Edinburgh Castle, Feb. 22, 1371. Consult Dunbar, *Scottish Kings* (Edinburgh, 1906).

BRUCE, DAVID (1855-). An English army surgeon and scientific writer, born in Melbourne, Australia. He was educated at Edinburgh University, became a surgeon in the Royal Army Medical Corps in 1883, and from 1884 to 1889 saw service in Malta and Egypt. In 1889-94 he was professor of pathology at the Army Medical School, Netley, Hampshire; from 1894 served in South Africa, and in 1901 was assigned to the home district. He was promoted to be surgeon major in 1895 and lieutenant colonel in 1900. He contributed several important articles regarding Malta fever to *The Practitioner* (1887-88); to the *British Medical Journal* (1889); the *Army Medical Service Blue Book* (1890); *Quain's Dictionary of Medicine*, and *Davidson's Diseases of Warm Climates*. He also prepared reports (1903) on the sleeping sickness in Uganda. He became editor of the *Royal Army Medical Journal* in 1904, and was a member of the Army Medical Advisory Board from 1902 to 1911.

BRUCE, EDWARD (?-1318). A king of Ireland, younger brother of Robert Bruce, King of Scotland. He was a chivalrous but rash and impetuous prince and was actively engaged in the struggle for Scotland's independence. In 1308 he made himself master of Galloway. In 1314 he was one of the Scottish commanders in the battle of Bannockburn. In 1315 the chieftains of Ulster tendered him the crown of Ireland, on condition that he should assist them to expel the English from the island. With an army of about 6000 men he landed in Ulster in May of that year and soon made himself master of the Province of Ulster. He was crowned King of Ireland, but was slain at Dundalk, in 1318. Consult Colvin, *The Invasion of Ireland by Edward Bruce* (Philadelphia, 1901); Dunbar, *Scottish Kings* (Edinburgh, 1906).

BRUCE, SIR FREDERICK WILLIAM ADOLPHUS (1814-67). A British diplomatist, born in Broomhall, Fifeshire, youngest son of the seventh Earl of Elgin. He was sent as Consul General to Egypt in 1849. Commissioned to secure the ratification of the Chinese treaty which his brother, the eighth Earl of Elgin, had negotiated at Tien-Tsin, Bruce was fired upon by the Taku forts—the immediate cause of the Anglo-French campaign against China in 1860. He was umpire between the United States and Colombia (1864) and in 1865 became Ambassador to the United States.

BRUCE, SIR GEORGE BARCLAY (1821-1908). An English engineer, born in Newcastle-on-Tyne. He was educated as a civil engineer by Robert Stephenson, was employed on various railways, and in 1850 completed his work as resident engineer upon the Royal Border Bridge, by which the Newcastle and Berwick Railway crossed the river Tweed at Berwick. In 1853 he was appointed chief engineer of the Madras Railway (India), and subsequently consulting engineer of the South Indian Railway. He was also engineer of numerous lines in Europe, South America, and New Zealand. In 1887-88 he was president of the Institute of Civil Engineers.

BRUCE, H(ENRY) ADDINGTON (BAYLEY) (1874-). An American journalist and author, born in Toronto, Canada, and educated at Upper Canada College and Trinity College, To-

ronto. He was for a time on the *Toronto Week*, then came to the United States, was employed by the American Press Association in 1897-1903, and afterward contributed to many periodicals, notably *The Outlook*, and published several books. His most successful work was in American history and in popularizing modern psychology and psychical research. He published: *The Riddle of Personality* (1908); *Historic Ghosts and Ghost-Hunters* (1909); *The Romance of American Expansion* (1909); *Daniel Boone and the Wilderness Load* (1910); a translation of Leroy-Beaulieu's *The United States in the Twentieth Century* (1906; new ed., 1911); *Scientific Mental Healing* (1911); *Woman in the Making of America* (1912).

BRUCE, JAMES (1730-94). A Scottish traveler. He was born in Kinnaird, Stirlingshire, and educated at Harrow and the University of Edinburgh. He studied law, and was (1754-61) a wine merchant. In 1762 he was appointed British agent at Algiers, but in 1765 resigned to study the ancient ruins in Barbary, his interest in which had first taken him to Africa. He undertook (1768) a journey through Abyssinia; in 1770 rediscovered the source of the Blue Nile, and after great hardships arrived, in November, 1772, at Assuan, Egypt. He claimed that he discovered the source of the Nile, thinking the Blue Nile the main river. He seems to have been the first European to trace the Blue Nile's course to its junction with the White. His interesting *Travels to Discover the Source of the Nile* (5 vols., 1790; 3d and best ed., 1813) is inaccurate because it was written after 1785 without reference to his journals, but it is truthful. Bruce was an accomplished linguist, but lacked critical scholarship. The *Travels* was translated into French (1790) by Castera, and into German (1790) by Volkmann. Consult: Murray, *The Life and Writings of James Bruce* (London, 1808); Murray's abridgment of the *Travels*; Head, *Life of Bruce* (ib., 1830); Playfair, *Travels in the Footsteps of Bruce* (ib., 1887).

BRUCE, MICHAEL (1746-67). A minor Scottish poet. He was born in Kinnesswood, Kinross-shire, the son of a weaver, and was employed as a herdboys. In 1762 he went to Edinburgh University to study for the Burgher ministry, and when not at college was a village schoolmaster. His poems, few but of a singular tenderness and pathos, were published in Edinburgh in 1770 by the Rev. John Logan (1748-88), his fellow student, who included in the volume poems "by different authors." Logan reprinted some of these, notably a fine *Ode to the Cuckoo*, as his own work, and hence is accused of appropriating Bruce's poems. Consult *Bruce's Works*, edited by Grosart (Edinburgh, 1865), with memoir and notes, and Mackenzie, *Life of Michael Bruce* (1905).

BRUCE, ROBERT (1210-95). The fifth Lord of Annandale, and competitor with John Baliol for the crown of Scotland. On the death of his mother, the Princess Isabel, in 1251, he did homage to Henry III for her lands in England and in 1255 was made Sheriff of Cumberland and Governor of Carlisle. The same year he was appointed one of the 15 regents of Scotland, during the minority of Alexander III. In 1264 he led, with Comyn and Baliol, the Scottish auxiliaries to the assistance of the English monarch at the battle of Lewes, where he was taken prisoner, but was released after the battle of

Evesham the following year. In 1290, when the Scottish throne became vacant by the death of Margaret, the "Maiden of Norway," granddaughter of Alexander III, Baliol and Bruce claimed the succession, the former as great-grandson of David, Earl of Huntingdon, by his eldest daughter, Margaret; the latter as grandson by his second daughter, Isabel. Edward I of England, to whom the dispute was referred, decided in favor of Baliol, Nov. 17, 1292. To avoid swearing fealty to his successful rival, Bruce resigned Annandale to his eldest son, Robert de Bruce, Earl of Carrick. He died at his castle of Lochmaben, Dumfriesshire, in 1295, leaving three sons and a daughter.

BRUCE, ROBERT (1274-1329). Liberator of Scotland, and King of that country from 1306 to 1329. He was the grandson of Robert Bruce, the competitor of Edward Baliol for the throne in 1290, and was born July 11, 1274. In the early part of his career he seems to have been guided entirely by selfish interests and to have played fast and loose with both English and Scotch. At first he favored the English interests, in the expectation, doubtless, of his father being raised to the Scottish throne, and in 1296, as Earl of Carrick, he swore fealty to Edward I at Berwick, and the following year he is said to have renewed his oath of homage at Carlisle. Shortly after, he abandoned the cause of Edward, joined the Scottish leaders in arms for the independence of their country, made his peace with the English monarch by the capitulation of Irvine concluded July 9, 1297, and once more took the field against him. In 1299, the year after Wallace's defeat at Falkirk, Bruce, again in favor with Edward, was made one of the four regents who ruled the kingdom in the name of Baliol, but apparently took no part in active hostilities, yet in the three campaigns which took place previous to the final subjugation of Scotland, contrived to retain the friendship of Edward. In 1305 he was consulted in the settlement of the government. With John Comyn, called the "Red Comyn," the nephew of Baliol, he had long been at enmity. In an interview between them, in the church of the Minorite Friars at Dumfries, on Feb. 10, 1306, a quarrel took place, and Bruce stabbed Comyn with his dagger. Rushing out to his attendants, he exclaimed, it is said: "I doubt I have slain the Red Comyn!" "You doubt!" cried one of them; "I mak sikker!" (i.e., sure), and, running into the church with some others, slew Comyn and his brother. Bruce hastened to Lochmaben Castle, assembled his vassals, and proclaimed his right to the throne. On March 27 he was crowned King at Scone. An English army, under the Earl of Pembroke, nominated by Edward Governor of Scotland, took possession of Perth, and on June 19 attacked Bruce in the wood of Methven, compelling him to retreat into the wilds of Athole. At Dalry, near the head of Loch Tay, Bruce was attacked by Alexander, Lord of Lorn, chief of the Macdougals, related by marriage to the Red Comyn, and compelled to retire. Sending his Queen and her ladies to Kildrummy Castle, Bruce fled to the highlands, and thence to the little island of Rachrine, on the coast of Antrim, Ireland. In his absence the English took the Queen and the Princess Marjory from the sanctuary of St. Duthac, Ross-shire. Many of Bruce's followers were beheaded or hanged, all his estates were confiscated, and he and his adherents were excommunicated

by the Pope's legate at Carlisle. Persecution, however, brought many adherents to Bruce. In the spring of 1307, with about 300 men, Bruce landed in Carrick, and at midnight surprised the English garrison in his own castle of Turnberry, but retired before a superior force into the mountainous districts of Ayrshire. At Loudon Hill, May 10, 1307, he defeated the English under the Earl of Pembroke, and three days after overthrew another army under the Earl of Gloucester. In less than two years he wrested from the English nearly the whole of Scotland. Edward I was dead, and Edward II was without the ability to hold his father's conquests. In the fall of 1312 the Scots invaded England, but with little success. In the autumn of 1313 Edward Bruce, brother of Robert, undertook the siege of Stirling Castle, held by Sir Philip Mowbray for the English. A treaty was entered into by which Mowbray bound himself to surrender the fortress if not relieved before the 24th of June in the following year. The anxiety of the English to save the stronghold from falling into the hands of the Scotch led to the memorable battle of Bannockburn, June 24, 1314, in which Bruce commanded in person. The English, under Edward II, numbering, it is said, about 100,000 men, were totally routed, leaving 30,000 dead upon the field; while the Scots, who were only about 30,000 strong, with 15,000 camp followers, lost about 5000. In 1317 Bruce passed over to Ireland to assist his brother Edward, elected King of that country, and defeated the Anglo-Irish under the Baron of Clare. In the spring of 1318 the Scotch army invaded England by the way of Northumberland. The English King retorted by an invasion into Scotland, but was compelled to retreat, and was followed by Bruce, who besieged Norham Castle and defeated Edward once more at Biland Abbey, Yorkshire. A truce, to last for 13 years, was concluded at Berwick on May 30, 1323. On the accession of Edward III in 1327, hostilities recommenced; but the Scots were again victorious, and a final treaty was ratified in a parliament at Northampton, April, 1328, recognizing the independence of Scotland and Bruce's right to the throne. A victim to leprosy, the King spent the last two years of his life at Cardross Castle, on the northern shore of the Firth of Clyde, and died June 7, 1329. His heart, extracted and embalmed, was delivered to Sir James Douglas to be carried to Palestine and buried in Jerusalem. Douglas was killed fighting against the Moors in Spain, and the sacred relic of Bruce, with the body of its devoted champion, was brought to Scotland and buried in the monastery of Melrose. Bruce's body was interred in the abbey church of Dunfermline, and in clearing the foundations for a third church on the same spot in 1819 his bones were discovered. He was twice married: (1) to Isabella, daughter of Donald, tenth Earl of Mar, by whom he had issue, a daughter, Marjory, wife of Walter, the High Steward, whose son ascended the throne as Robert II; and (2) to Elizabeth, daughter of Aymer de Burgh, Earl of Ulster, who bore him two sons, one who succeeded him as David II, and one who died in infancy, and two daughters. Consult: Kerr, *Life and Reign of Robert the Bruce* (Edinburgh, 1811); Longman, *History of the Life and Times of Edward III* (London, 1869); Dunbar, *Scottish Kings* (Edinburgh, 1906); Lang, *Story of the Bruce* (New York, 1907).

BRUCE, or **BRUS**, **THE**. See **BARBOUR**, **JOHN**.

BRUCE, **VICTOR ALEXANDER**. See **ELGIN AND KINCARDINE**, **EARL OF**.

BRUCE, **WILLIAM SPEIRS** (1867-1921). A Scottish scientist and Arctic and Antarctic explorer, born at Edinburgh, Scotland. He was educated at the University of Edinburgh. As naturalist he accompanied the Scottish Antarctic Expedition in 1892-93, Major Andrew Coats's Expedition to Nova Zembla and Wiche Islands in 1898, and the Prince of Monaco's expeditions to Spitzbergen in 1898, 1899, and 1906, and as zoölogist, went with the Jackson-Harmsworth Polar Expedition in 1896 and 1897. In 1895 and 1896 he had charge of the Ben Nevis Observatory and in 1899-1901 was lecturer on geography at Heriot-Watt College in Edinburgh. He had command of the Scottish National Antarctic Expedition in 1902-04. Besides his bathymetrical survey of part of the South Atlantic Ocean and Weddell Sea and his discovery of 150 miles of coast line of Antarctica, named Coats's Land, he surveyed Prince Charles Foreland and other parts of Spitzbergen in 1906, 1907, 1909, and 1912. He published *Polar Exploration* in 1911.

BRUCEA (named after the African traveler, J. Bruce). A genus of shrubs belonging to the family Simarubaceæ. *Brucea ferruginea* is an Abyssinian species, the leaves of which are said to be tonic, astringent, and useful in dysentery. Those of *Brucea sumatrana*, a native of the Indian Archipelago, China, etc., possess the same medicinal properties. The seeds of this species contain saponin, quassin, a bitter principle, etc., and are locally of repute as a specific for dysentery. They are intensely bitter. The Abyssinian species acquired a fictitious importance in the beginning of the nineteenth century from a mistaken belief that it produced the dangerous false Angostura bark, and in this belief the name *Bruceine* (q.v.) was given to an alkaloid really produced by the *nux vomica* (q.v.) and other species of *Strychnos* (q.v.). See **ANGOSTURA BARK**.

BRUCE-JOY, **ALBERT** (1842-1924). An Irish sculptor. He was born in Dublin and studied at South Kensington and the Royal Academy under Foley and afterward in Rome. Among his numerous works are the colossal statues of prominent men, such as Gladstone (before Bow Church), John Bright, and Alexander Balfour (Liverpool); monuments like the Archbishop Benson Memorial (Rugby Chapel, 1898); many busts, including those of Matthew Arnold (Westminster Abbey), Adams, the astronomer (ib.), Mary Anderson (Stratford-on-Avon), Loudon Snowden (Philadelphia), and Chauncey Depew (Lotos Club, New York), and many charming medallions. Bruce-Joy visited America twice, and a number of his works, besides those mentioned, are in New York, Boston, and Philadelphia. The Ayer colossal lion in Lowell, Mass., is also by him. Of his ideal works, the best known are "The First Flight" and "The Forsaken." Bruce-Joy's art marks a distinct progress over that of his master, Foley. It is original, versatile, showing a good knowledge of technique. But his minute representation of feature and detail sometimes results in a rather commonplace characterization. His marble bust of King Edward VII was unveiled in the Palace of Peace at The Hague in 1913.

BRUCH, **BRÜG**, **MAX** (1838-1920). A German composer. He was born in Cologne, of Jewish parents, on Jan. 6, 1838. At first taught

by his mother, then by Breidenstein, he exhibited remarkable precocity, producing a symphony at 14. As a Mozart scholar (1853-57) he was instructed by Hiller in theory and composition, and by Reinecke and Breuning in piano. In 1863 he brought out the opera *Lorelei*, with Geibel's libretto, written for and partly set to music by Mendelssohn. In 1865 he was made director of the Musikinstitut in Coblenz, and in 1867 became kapellmeister to the Prince of Schwarzburg-Sondershausen. In 1870 he went to Berlin, was conductor of the Liverpool Philharmonic Society (1880-83), of the Breslau Orchestral Society (1883-90), and afterward lived in Berlin and Bonn. He visited the United States in 1883 and conducted his oratorio *Arminius* in Boston. Max Bruch ranks among the first musicians of Germany as the representative of the epic cantata. His works include orchestral and chamber music; the operas *Jungfrau von Orleans* (Cologne, 1859) and *Hermione* (Berlin, 1872); *Römischer Triumphgesang*, for male chorus and orchestra, op. 19; the cantatas *Frithjof*, *Salamis*, *Normannenzug*, *Die Flucht der heiligen Familie*, op. 20; *Schön Ellen*, op. 24; *Odysseus*, op. 41; *Das Lied von der Glocke* (Schiller's poem), op. 45; and *Achilleus*, op. 50. The *Scenes from the Frithjof Saga* are the best known of his orchestral works. *Kol Nidrei*, a Hebrew melody for the 'cello, is a favorite with all 'cellists. His four concertos for violin and orchestra rank among the greatest works of their kind. Especially the first one in G minor, op. 26, is in the repertoire of every violinist of note. Three symphonies (E flat, F minor, E) are also noteworthy. In the field of chamber music he has written two string quartets and a trio. Consult Fuller-Maitland, *Masters of German Music* (London, 1894).

BRUCHESI, brōō-kā'zé, LOUIS JOSEPH PAUL NAPOLEON (1855-). A French-Canadian archbishop. He was born in Montreal and was educated in his native city, in France, and in Rome (where he was ordained to the priesthood in 1878). After several years' service as priest in Montreal, he was appointed professor of Christian apologetics in Laval University, upon the establishment of a Montreal branch in 1887. He soon became vice rector of the university and chairman of the board of commissioners which supervises the Catholic provincial schools. (See QUEBEC.) In 1897 he was appointed Archbishop of Montreal. His devotion to the cause of temperance resulted in the founding of the Anti-Alcoholic League in 1907, and other movements for social and industrial betterment received his active support. He established an order of nurses known as the Sisters of Hope, became vice president in 1909 of the Dominion Forestry Association, and at the various councils of his church took a prominent place.

BRUCHSAL, brōōō-zäl (Mediæval *Brusolegum*, from Ger. *Brücke*, OHG. *brucka*, Eng. *bridge* + *Saalbach*). A town in the Grand Duchy of Baden, Germany, situated on the Saalbach, and on the railway between Heidelberg and Karlsruhe, 12 miles northeast of the latter place (Map: Germany, C 4). Among its interesting buildings are the church of St. Peter, the burial place of the bishops of Speyer, and the old castle. It is an important railway centre, and manufactures cigars, soap, candles, lamps, barrel staves, and gunstocks. Buchsal is mentioned in 937 as the royal villa of German emperors and kings. It later became the summer

residence of the bishops and in 1802 was ceded to Baden. The Peasants' War first broke out here during the Reformation period, and it figures in later wars as the scene of numerous engagements. Pop., 1890, 11,902; 1905, 14,931; 1910, 15,391. Consult Hirsch, *Castle of Bruchsals* (New York, 1910).

BRUCINE, brōō'sin (from *Brucea*, for which *Strychnos nux vomica* was mistaken), $C_{22}H_{27}N_2O_4 + 4H_2O$. One of the alkaloid constituents of poison nut, the seed of *Strychnos nux vomica*, and therefore present in the extracts and the tincture of nux vomica, which are used in medicine. It may be isolated from the seed by boiling with water containing some oxalic acid. Its physiological action is the same as that of strychnine, though only one-sixth as powerful. It is scarcely soluble in water and insoluble in ether, but is soluble in alcohol and in chloroform. It dissolves in nitric acid with a beautiful blood-red color, which turns yellow on warming the solution; if stannous chloride is now added, an intense violet coloration is produced. By this reaction very small quantities of brucine may be detected. On the other hand, brucine is used for the detection and quantitative determination of nitric acid (for instance, in potable waters). Both strychnine and brucine are combined in nux vomica with igasuric acid. The *Strychnos nux vomica* is indigenous to India and the East Indian Islands. See ALKALOIDS.

BRUCITE (named for a New York mineralogist, Dr. Bruce). A native hydrate of magnesium having the composition $MgO \cdot H_2O$, but containing also small quantities of magnesium carbonate. The crystals are rhombohedral and tabular in habit. The mineral is of more frequent occurrence in translucent foliated masses and in fibrous forms. The lustre is pearly or waxy to vitreous, and the color white, gray, bluish, or green. Brucite occurs in serpentine and limestone associated with other magnesium minerals. It is found at Hoboken, N. J., at Lancaster and Texas, Pa., and in several other localities. The mineral is completely soluble in acids.

BRUCK. See BRUGG.

BRUCK, brōōk, KARL LUDWIG, BARON (1798-1860). An Austrian statesman, born at Elberfeld. He formed the plan of consolidating all the insurance societies of Trieste into one company, and thus was originated the Trieste Lloyd (1833), afterward known as the Austrian Lloyd. In 1848 he was a deputy to the National Assembly at Frankfort, where he was appointed the Plenipotentiary of Austria to Archduke John, Vicar of Germany. He later became Minister of Commerce in the Schwarzenberg-Stadion cabinet, in which capacity he may be said to have created a new industrial epoch in Austria. The Austro-German Postal Union (Dec. 5, 1851), the Austro-German Telegraph Union, and commercial and customs reforms were the results of his administration. His policy was utterly at variance with reactionary tendencies, and in 1851 he was compelled to resign. He was recalled in 1855 to accept the portfolio of Finance, but later found himself unable to cope with the disastrous conditions resulting from the general political system of the country and the obligations entailed by the Italian War of 1859. The unfortunate state of the finances was attributed directly to the Minister. Under these circumstances he demanded and received his release from office, and on the day following (April 23,

1860) committed suicide. An inquiry into his official life, which was subsequently held, completely vindicated his integrity.

BRÜCKE, brük'e, ERNST WILHELM VON (1819-92). A German physician and physiologist, born in Berlin. He studied medicine at the universities of Berlin and Heidelberg, in 1846 became an instructor in anatomy at the Academy of Fine Arts, Berlin, and in 1848 professor of physiology at the University of Königsberg. In 1849 he was called to the chair of physiology and microscopic anatomy at the University of Vienna. Among his more important works are: *Anatomische Beschreibung des Augapfels* (1847); *Grundzüge der Physiologie und Systematik der Sprachlaute* (1856); *Neue Methode der phonetischen Transkription* (1863); *Vorlesungen über Physiologie* (2 vols., 1873-74; 4th ed., 1885-87); *Wie behütet man Leben und Gesundheit seiner Kinder?* (4th ed., 1892).

BRÜCKER, brük'ër, JOHANN JAKOB (1696-1770). A German writer on the history of philosophy. He was educated in Jena, and taught there for some years, and then became pastor of the Protestant church of St. Ulrich in his native place, Augsburg. He was made a member of the Berlin Academy of Sciences in 1731. His chief work was *Historia Critica Philosophiæ* (6 vols., 1742-67), which had a great success, and formed the basis of many subsequent works. He wrote many other works on philosophical subjects including *Kurze Fragen aus der Philosophischen Historie* (7 vols., 1731-36) and *Institutiones Historiæ Philosophicæ* (1747), and superintended and corrected a polyglot edition of Luther's translation of the New Testament (6 vols., 1766-70).

BRÜCKNER, brük'ner, ALEXANDER (1834-96). A Russian historian. He was born in St. Petersburg and studied in Heidelberg, Jena, and Berlin. He was professor of history at the Imperial School of Law (1861-67), private lecturer at the university, and professor of Russian history at Odessa, Dorpat (1872-91), and Kazan (1891). He is the author of a large number of important works bearing upon Russian history and conditions, including *Finanzgeschichtliche Studien*; *Kupfergeldkrisen* (1867); *Ucan Possoshkoff, Ideen und Zustände im Zeitalter Peters des Grossen* (1878); *Peter der Grosse* (1879); *Katharina die zweite* (1883); *Beiträge zur Kulturgeschichte Russlands im 17. Jahrhundert* (1887); *Die Europäisierung Russlands Land und Volk* (1888). The works written by him in Russian include *The Russo-Swedish War of 1788-90* (1890) and *Potemkin* (1892).

BRÜCKNER, ALEXANDER (1856-). An Austrian Slavic scholar. He was born in Tarnopol (Galicia) and studied in Lemberg. He made special researches regarding the history of Polish literature during the Middle Ages and in the seventh century. In 1881 he was appointed professor of Slavic languages and literature in the University of Berlin. He published numerous essays in the *Archiv für slavische Philologie*; *Die slavischen Fremdwörter im Litauischen* (1877); *Die slavischen Ansiedlungen in der Altmark und im Magdeburgischen* (1879); *Geschichte der polnischen Litteratur* (1901); *Facecye polski z roku* (1903); *Geschichte der russischen Litteratur* (1905; Eng. trans. under the title *A Literary History of Russia*, 1908). He wrote, besides,

numerous literary, historical, biographical, and other essays, pamphlets, and reviews.

BRÜCKNER, bröök'nër, ANTON (1824-96). An Austrian organist and composer, born at Ansfelden, Upper Austria, Sept. 4, 1824. He was an orphan and largely self-taught, but such was his diligence that in 1855 he won the position of organist in Linz in an open competition. Although even then he was an excellent organist and contrapuntalist, he made frequent trips to Vienna, where he studied under Sechter and Kitzler. After the former's death in 1867 Bruckner succeeded him as court organist in Vienna, and at the same time was appointed professor of organ, counterpoint, and composition at the Conservatory. In 1875 he also became lecturer on music at the university. His concert tours of France (1869) and England (1871) established his fame as one of the greatest organ virtuosi. Bruckner's position as a composer is unique. He did not become generally known until his seventh symphony (in E) was produced by Nikisch in Leipzig in 1884, and even then the great conductors (Richter, Mahler, Schalk) were far more interested in his works than the general public. Bruckner is essentially an instrumental composer, but, instead of developing the symphony along the lines of natural evolution, he attempted to graft the principles of Wagner's dramatic art upon the symphony. The result is that, in spite of pregnant themes, passages of great brilliancy, and splendid power, there is always a lack of coherence and unity. The mood changes too frequently, the transitions are too abrupt. Such music becomes intelligible only when explained by some dramatic action. In his desire to convey his ideas to his hearers Bruckner loses all sense of proportion. There is no inner necessity that warrants such expansion of form, as is justified in the works of Beethoven and Brahms.

Bruckner's fame and importance rest upon his eight symphonies (1, Cm; 2, Cm; 3, Dm; 4, E flat; 5, B flat; 6, A; 7, E; 8, Cm). Of a ninth symphony three movements were finished. A really great work is the *Te Deum* (1886). He also wrote two masses, a requiem, and the choral works with orchestra, *Germanenzug* and *Helgoland*; a string quintet; and several a cappella choruses. Consult: F. Brunner, *Anton Bruckner* (Linz, 1895); F. Graefinger, *Anton Bruckner, Bausteine zu seiner Lebensgeschichte* (Munich, 1911); M. Morold, *Anton Bruckner* (Leipzig, 1912).

BRÜCKNER, EDUARD (1862-). A German geographer, born at Jena. He was educated at the universities of Dorpat and Munich. Besides editing the *Meteorologischen Zeitschrift* from 1885 to 1891, he was professor of geography at Bern in 1888-1904. In the latter year he became professor of geography at Halle, and in 1906 at Vienna. His works include: *Die Vergletscherung des Salzachgebietes* (1886); *Klimaschwankungen seit 1700* (1890); *Das Feste Erdrinde und ihre Formen* (1897); *Die Schweizere Landschaft einst und jetzt* (1900); *Die Alpen im Eiszeitalter*, with A. Penck (1901-07). He became editor of the *Zeitschrift für Gletscherkunde* in 1906.

BRUDENELL, JAS. THOS. See CARDIGAN, EARL OF.

BRUEDER-GEMEINDE (brü'dër ge-mîn'de) MENNONITES. See MENNONITES.

BRUEGEL, or **BREUGEL**, brü'kël. A

family of Flemish genre and landscape painters. —PIETER THE ELDER (c.1525–69), called "Peasant-Bruegel," by reason of his subjects, was born at the Dutch town of Bruegel near Breda (whence the family name). He studied with Coeck at Antwerp, but was most influenced by the paintings of Hieronymus Bosch, whose home was near his birthplace. He passed several years in Italy, but without losing his Flemish traits. The journey, especially through the Alps, influenced his landscape. From Italy he returned to Antwerp, and in 1562 removed to Brussels, where the remainder of his life was spent. Pieter Bruegel the Elder occupies an important position in the history of art as the father of peasant painting. Brouwer, Teniers, and Ostade in the seventeenth century and Millet in the nineteenth century (as he himself said) were but his worthy successors. (See *GENRE PAINTING*.) His pictures, usually representing humorous peasant scenes, are somewhat coarse in character, but possess spirit and comic power. They are numerous in Flemish, Dutch, and German collections, particularly in that of Mayer van der Bergh in Antwerp and in the Imperial Gallery of Vienna. His masterpiece of this kind is said to be "The Blind," in the Museum of Naples. He was also one of the most important landscape painters of Flanders, as may be seen in the remarkable series of his landscapes at Vienna. Technically his work was very individual. He generally uses pure local colors without intermediate tints, yet achieves harmony of tone. His spirited and important engravings have been edited by Van Bastelaer.—His eldest son, PIETER BRUEGEL THE YOUNGER (1564–c.1637), was born in Brussels and studied with Gillis van Coninxloo at Antwerp. Like his father, he painted rural and genre subjects, but he is generally known as "Höllen-Bruegel" because of his fondness for representing the infernal regions and subjects like devils, witches, and robbers.

JAN BRUEGEL THE ELDER (1568–1625), the younger son of Pieter the Elder, is usually called "Velvet-Bruegel" from the softness and smoothness of his technique. He was born at Brussels, studied with Goetkind in Antwerp, and spent several years in Italy. On his return to Antwerp (c.1597) he soon acquired great wealth and high honors. He was dean of the Painter's Guild 1601–02 and, like his intimate friend Rubens, was official painter to the regents of the Netherlands. His landscapes, the prevailing color of which is usually green or blue, are important in the development of landscape painting. They usually contain many small figures and are numerous in all the principal European collections. The most important are probably the 54 examples in the Gallery of Madrid; Dresden possesses 17, and Munich an equal number. He also painted landscapes for many prominent figure painters, especially for Rubens, who in turn painted figures in Bruegel's landscapes, as the Adam and Eve in his delightful "Paradise" (The Hague).—His son and pupil JAN BRUEGEL THE YOUNGER (1601–78), whose works are difficult to distinguish from his father's, inherited the latter's atelier and popularity.—For the family Bruegel consult Rooses, *Geschiedenis der Antwerpsche bilderschool* (Antwerp, 1887–90), and Michel, *Les Brueghel* (Paris, 1892). For Pieter Bruegel the Elder, see the excellent monograph of Van Bastelaer and Hulin (Brussels, 1905–07); also those of

Bernard (ib., 1908) and Hausenstein (Leipzig, 1910).

BRUES, brōōz, CHARLES THOMAS (1879–). An American zoölogist, born at Wheeling, W. Va. He was educated at the University of Texas and at Columbia University. In 1904–05 he was special field agent of the Bureau of Entomology, United States Department of Agriculture, and from 1905 to 1909 was curator of invertebrate zoölogy in the Milwaukee Public Museum. He then became instructor in economic entomology at Harvard University. From 1907 to 1909 he edited the *Bulletin* of the Wisconsin Natural History Society and in 1910 became editor of *Psyche*, a journal of entomology. His publications include articles on taxonomy, embryology, and ethology of insects, especially of the Hymenoptera and Diptera.

BRUEYS. See BRUYS.

BRUGES, brūzh (Ger. *Brügge*, Dutch *Brugge*, O. Dutch *Bruggen*, bridges, from OHG. *brucka*, Ger. *Brücke*, AS. *brycg*, Eng. *bridge*). An old city of Belgium, capital of the province of West Flanders, situated about 8 miles from the North Sea, with which it is connected by two canals (Map: Belgium, B 3). The town is intersected by numerous canals crossed by 54 bridges, from which latter it derives its name.

From a purely architectural point of view Bruges, more than any other city of Belgium, has preserved the characteristic appearance of the Middle Ages. Among the most interesting buildings are the Hôtel de Ville, a graceful structure in pure Gothic style, with six turrets, dating from the fourteenth century; the market hall (les Halles) erected in the sixteenth century on the site of a thirteenth-century structure some of whose materials were utilized, including a superb belfry, with its 48 bells, reputed to be among the finest chimes in Europe; the palais de justice, containing a celebrated chimney piece—an exquisite specimen of wood carving, with the statues of Charles V, Maximilian, Mary of Burgundy, and Charles the Bold amid a maze of ornaments, escutcheons, and portraits. In the ancient hospital of St. John, dating from the twelfth century, are preserved some choice paintings by Memling: his famous "Reliquary of St. Ursula"; the beautiful triptych of the "Marriage of St. Catharine," and the "Epiphany," the best example of that master's early style. The church of Notre Dame, an early Gothic structure, with a tower 395 feet high, contains a number of valuable paintings and sculptures, notably the tombs of Charles the Bold and Mary of Burgundy, and an exquisite life-size marble group of the Virgin and Child, attributed to Michelangelo, by whom it was undoubtedly at least designed. Horace Walpole is said to have offered 30,000 florins for it. The cathedral of St. Sauveur is a plain brick structure in the early Gothic style, but its interior has good proportions, is tastefully decorated, and contains fine paintings by eminent masters, two monumental brasses, and beautiful choir stalls. The chapelle du Saint-Sang is an elegant two-storied building with fine stained-glass windows, the lower church dating from 1150, the upper from the fifteenth century. The edifice was restored in 1819–39. Here, according to tradition, Theodoric of Alsace deposited some drops of the blood of the Saviour brought from Palestine in 1149, the 700th anniversary of which event was celebrated in 1850 with all ecclesiastical pomp. The picture gallery of the academy in

the museum is noteworthy for its choice specimens by early Flemish masters.

Bruges contains an academy of art, a conservatory, and two hospitals. Lace making and horticulture (suburban) are important industries. The communal population was 49,308 in 1840, 52,867 in 1900, and 53,285 (24,179 men, 29,106 women), Dec. 31, 1910 (census).

It is believed that St. Chrysolus preached here as early as the third century. In the Middle Ages Bruges became one of the chief commercial centres of northern Europe with about 200,000 inhabitants. From 1240 to 1426 it was a leading mart of the Hanseatic League. It formed part of the possessions of the dukes of Burgundy and, with the rest of Flanders, passed to the house of Hapsburg. And it was at Bruges during the Burgundian rule that, in 1430, the Order of the Golden Fleece was instituted. Internal disorders, coupled with the neglect of its port, led to a steady decline of its commerce, and its greatness has long since left it. Hardly another city of Europe has such a large proportion of paupers. Bruges has extensive textile mills, breweries, and shipyards, and produces fine lace. During the wars of the Spanish and Austrian successions the city was besieged by the Dutch and the French. In 1794 it was taken by the latter, and from 1814 to 1830 it belonged to the Netherlands. Consult Duclos, *Bruges; histoire et souvenirs* (Bruges, 1910).

BRUGG, bröög, **BRUG**, or **BRUCK**, bröök (OHG. *brucka*, Ger. *Brücke*, AS. *brycg*, Eng. *bridge*, referring to the stone bridge across the Aar, built in the sixteenth century). A village in the Canton of Aargau, Switzerland, 1100 feet above sea level, on the right bank of the Aar, and near the mouth of the Reuss, about 13 miles northeast of Aargau (Map: Switzerland, C 1). Among the industries are silk mills, machine shops, chemical works, and a power house. Brugg occupies a portion of the site of the ancient Helvetian and Roman city of Vindonissa. The Schwarze Turm ('Black Tower') was erected during the Roman occupation. The town was the seat of the counts of Hapsburg, the ruins of their chief castle being 2 miles to the southwest. Pop., 1900, 2629; 1910, 3802.

BRUGMANN, bröög'mán, **FRIEDRICH KARL** (1849-). A German comparative philologist, born in Wiesbaden, March 16, 1849. He studied in Halle and Leipzig, and was instructor in classical languages in the gymnasium in Wiesbaden from 1872 to 1873 and in Leipzig from 1873 to 1877. In 1877 he became privat-docent at the University of Leipzig and in 1882 was appointed assistant professor. He was called to the chair of comparative philology in Freiburg in 1884, and in 1887, after the death of Curtius, he was recalled to Leipzig to succeed the latter. With Osthoff (of Heidelberg) Brugmann became the foremost representative of the new and revolutionary school of philologists known as *Junggrammatiker*, or 'Neo-grammarians.' This school followed Leskien, especially in urging the inviolability of laws of sound changes, and in emphasizing the working of analogy as an important linguistic factor, as well as in laying stress on the observation of phonetic laws and their operation in modern languages. These principles Brugmann developed with Osthoff in their *Morphologische Untersuchungen auf dem Gebiete der indogermanischen Sprachen* (vols. i-iv, 1878-87; vol. v, 1889).

Very important in the history of the new movement was Brugmann's article on "Nasalis Sonans," in Curtius's *Studien zur griechischen und lateinischen Grammatik*, vol. ix (Leipzig, 1868-78). The views advanced in this paper were so much in opposition to the ideas of Curtius that a personal rupture between the men was the final result. The theories of the development of the Indo-Germanic vocalic nasal are, however, to-day universally acknowledged by linguists, although the battle between the old school and the new raged for 20 years. Brugmann's greatest contribution to philology is the monumental work, *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen*, the first edition of which appeared in 2 vols. of 4 parts each (Strassburg, 1886-92), with an additional 3 vols. on Syntax by Delbrück (1893-1900). This edition, without the syntax, was translated into English in 4 vols. (1888-95), and the publication of a second edition was begun in 1897. In this work Brugmann collects and classifies with great learning the vast mass of material bearing upon the phonology and inflection of the Indo-Germanic languages. Other important works of Brugmann are: *Ein Problem der homerischen Textkritik* (1876); *Litauische Volkslieder und Märchen*, in collaboration with A. Leskien (1882); *Zum heutigen Stand der Sprachwissenschaft* (Strassburg, 1885); *Griechische Grammatik* (4th ed., 1913); *Kurze vergleichende Grammatik* (Strassburg, 1902-04). In connection with W. Streitberg he is editor of the *Indogermanische Forschungen* (Strassburg, 1892 et seq.). He has been knighted by the King of Saxony, and in 1896 he was invited, with other distinguished scholars, to attend the Jubilee of Princeton University, New Jersey, where he received the degree of Doctor of Laws.

BRUGSCH, brööksh, **HEINRICH KARL** (1827-94). A German Egyptologist. He was born in Berlin, Feb. 18, 1827. At the age of 16 he applied himself with signal success to the decipherment of Demotic, which had been neglected since the death of Champollion in 1832. Brugsch's work, *Scriptura Aegyptiorum Demotica* (Berlin, 1848), containing the results of his studies in this difficult branch of Egyptology, appeared while he was a student at the gymnasium. It was followed by his *Numerorum Demoticorum Doctrina* (1849) and his *Sammlung demotischer Urkunden* (1850). His *Grammaire démotique* (Paris, 1855) formed the basis of all subsequent studies in Demotic. After completing his philological and archaeological studies, Brugsch visited the museums of Paris, London, Turin, and Leyden, and in 1853 went to Egypt for a stay of some duration. After this he returned to Berlin, where in 1854 he was appointed privat-docent in the university, and in 1855 assistant in the Egyptian department of the Royal Museum. He again visited Egypt in 1857, and in 1860 accompanied in an official capacity the embassy sent to Persia by the Prussian government. On the death of the chief of the embassy, Baron von Minutoli, Brugsch assumed the management of affairs and acquitted himself with credit. In 1864 he was Consul at Cairo. He returned to Germany four years later and held for a time a professorship in Göttingen; but in 1870 he was recalled to Egypt by the Khedive to take the direction of the Ecole d'Égyptologie. In 1873 he represented the Egyptian government at the Vienna Ex-

position and in the same year received the title of Bey and was placed in charge of the projected museum of Arabic antiquities. He later received the title of Pasha. In 1876 he visited America as commissioner of the Egyptian government to the Centennial Exposition in Philadelphia. He returned to Egypt, but failing to receive the position of director of the Egyptian Museum at Gizeh, left vacant by Mariette's death, Brugsch took up his residence in Berlin. There he lectured at the university, but was, in 1883 and again in 1885, sent by the German government on a mission to Persia. After his return he retired to Charlottenburg, where he passed the remainder of his days in literary work. He died Sept. 9, 1894. After his early achievements in the elucidation of Demotic, Brugsch soon applied himself to other branches of Egyptology and everywhere with remarkable success. Egyptian grammar and lexicography, together with the geography, history, and religion of ancient Egypt, were the subjects to which his attention was chiefly directed. To his great natural ability he added an enormous capacity for work, and he was a most prolific writer. Among the most important of his works besides those mentioned are his *Geographische Inschriften* (Leipzig, 1857-60); *Histoire d'Égypte* (Leipzig, 1859); *Recueil des monuments égyptiens* (Leipzig, 1862-63); *Hieroglyphisch-demotisches Wörterbuch* (Leipzig, 1867-82); *Dictionnaire géographique de l'ancienne Égypte* (Leipzig, 1877-81); *Hieroglyphische Grammatik* (Leipzig, 1872); *Geschichte Ägyptens* (Leipzig, 1877); *Religion und Mythologie der Ägypter* (Leipzig, 1887); and *Thesaurus Inscriptionum Aegyptiacarum* (Leipzig, 1883-91). He was the founder (1863) of the Egyptological journal, *Zeitschrift für Ägyptische Sprache*. The influence of Brugsch on modern Egyptology has been very great. Consult Maspero, "Henry Brugsch," in *Smithsonian Institution Annual Report*, 1896, pp. 667-672 (Washington, 1898).

BRÜHL, brül, HEINRICH, COUNT VON (1700-63). Prime Minister of Augustus III of Poland and Saxony. He was born near Weissenfels, in Thuringia. His attractive personality and courtly address won him the favor of Augustus II and, after Augustus' death, that of his son. Rapidly passing through various grades of office, he became Prime Minister in 1746 and, obtaining complete control of the government, held it till his death. Avarice was his guiding motive, and to gratify this passion he burdened the country with taxes, wrecked the treasury, solicited bribes, appropriated estates, and grasped the income of numberless offices. He surrounded the weak Augustus with spies and made him absolutely pliable to his will. Vanity made him ostentatious and impelled him to outdo all others, even the King, in magnificence. In his foreign policy he was vacillating and mercenary. The demoralization of the Saxon army, the unwise alliance with Austria, and the disaster at Pirna (q.v.) may be attributed to Brühl's course during the wars of Frederick. King and Minister fled to Warsaw after the loss of the Saxon army in 1756. Both came back to Dresden when peace was made at Hubertsburg, and both died there in October, 1763. Consult Justi, *Leben des Grafen von Brühl* (Göttingen, 1760-61), and Krosigk, *Graf von Brühl und seine Eltern* (Berlin, 1911).

BRUHNS, bröons, KARL CHRISTIAN (1830-

81). A German astronomer, born in Plön (Holstein). He studied practical mechanics, in 1852 was appointed an assistant in the Berlin Observatory, and in 1859 became a lecturer at the university. In 1860 he was appointed professor of astronomy and director of the observatory at the University of Leipzig. He discovered six comets, in 1863 organized the meteorological service of Saxony, and in 1878 established in Leipzig one of the first German bureaus for the publication of weather forecasts (later transferred to Chemnitz). His publications include many contributions to periodicals and reports, *Die astronomische Strahlenbrechung in ihrer historischen Entwicklung* (1861), an excellent biography (1869) of J. F. Encke (q.v.), the Berlin astronomer, and a new manual of logarithms to seven places of decimals (8th ed., 1909).

BRUIN, SIR. The bear; the king's messenger in *The History of Reynard the Fox*, who speeds with Reynard to his own discomfiture. See REYNARD THE FOX.

BRUIS, bru'ê, or **BRUEYS**, PETER DE. See BRUYS.

BRUISE (OF. *bruiser*, Fr. *briser*, AS. *brýsan*, to break, bruise), or **CONTUSION**. An injury inflicted by a blow or sudden pressure, in which the skin is not necessarily broken. Both terms, and especially the latter, are employed in surgery to include such injuries in their widest range, from a black eye to a thoroughly crushed mass of muscle. In the slighter forms of this injury, as in ordinary simple bruises, there is no tearing, but only a concussion of the tissues, the utmost damage being the rupture of a few small blood vessels, which occasions the discoloration always observed in these cases. In more severe contusions the subjacent structures—muscles, connective tissue, vessels, etc.—are more or less ruptured, and in extreme cases are thoroughly crushed and often become gangrenous. The quantity of blood that is extravasated mainly depends upon the size and number of the ruptured blood vessels, but partly also on the nature of the tissues injured. Thus, a lax tissue, as that of the eyelids, favors the escape of blood into the surrounding parts. The most characteristic signs of a recent contusion are more or less shock (q.v.), pain, swelling, and discoloration of the surface from effused blood. (See ECHYMOSIS.) There is nothing special in the character of the shock, but it is worthy of notice that it is most severely felt in injuries of special parts—as the testes, the breasts, and the larger joints, which are often followed by remarkable general depression, faintness, loss of muscular power, and nausea. The immediate pain following the blow is succeeded by a feeling of numbness, which after a varying time, unless the part is killed, gives place to a heavy, aching pain. Although some depression may be observed immediately after the infliction of the blow, swelling of the parts rapidly follows. In lax parts, such as the eyelids, the swelling is often considerable, and may remain for a week or more, but in other parts it usually subsides in two or three days. The discoloration passes successively through the variations of red, purple, black, green, and yellow. It is due to the effused blood and the changes which subsequently take place in it. The fluid part of the blood and the colorless corpuscles are reabsorbed in the process of repair, but the red corpuscles are left behind, and it is the transformation of their

hemoglobin into hæmatoidin which brings about the characteristic color changes.

As a result of contusion we may have a hæmatoma, or blood tumor, sloughing of a part, septic infection of the extravasated blood or abscess, inflammation of special structures, as nerve trunks, synovial membranes of joints, tendon sheaths, the periosteum of bone, etc. It seems fairly certain that tumors, malignant and benign, may be stimulated to growth from a contusion. The treatment of contusion consists in stimulating measures to combat shock when present; locally rest and elevation of the parts are indicated, together with moist and cold or hot applications in the first stage to allay pain and inflammation. When inflammation has subsided, massage and stimulating applications should be employed to hasten absorption of the effused blood products.

BRÜLL, brül, IGNAZ (1846-1907). An Austrian pianist and composer, born in Prossnitz, Moravia. He studied the pianoforte under Epstein, and composition under Ruffinatscha and Dessoff, and appeared in concerts in Vienna and London with success. His works for the orchestra have given him fame as a composer, and he has also written chamber music and several operas, which have taken a place in the modern repertory. These include *Das goldene Kreuz* (Berlin, 1875), his best-known work; *Der Landfriede* (1877); *Königin Mariette* (Munich, 1883); *Das steinerne Herz* (Vienna, 1888), and the comic opera *Der Husar* (1898). He also wrote a symphony: three serenades for orchestra; three overtures (*Macbeth*, *Im Walde*, *Pathétique*); a concerto for violin; two concertos for piano; a rhapsody for piano and orchestra, four suites for piano; three sonatas for violin and piano; one sonata for cello and piano; a trio; many excellent compositions for piano, songs, and choruses.

BRÜLOFF, brü'lof, KARL PAVLOVITCH (1799-1852). A Russian painter, born in St. Petersburg. He was one of a family of artists descended from a French refugee and early showed such promise that he was sent to Italy with his brother to study. One of his best-known works, executed while there, is "Pompeii" (1833), now in the Museum Alexander III, at St. Petersburg. After leaving Italy he visited Greece, Turkey, and the Holy Land, and on his return to Russia settled in Moscow. Afterward he resided in St. Petersburg, where he was professor at the Academy and the master of many pupils. He painted portraits, genre scenes, a few historical subjects like "The Murder of Inez de Castro" (Hermitage, St. Petersburg); some frescoes in the cathedral of St. Isaac, and many religious pictures. Numerous examples of his works are to be found in the museums of St. Petersburg and Moscow. Consult his biography by Dobberts (St. Petersburg, 1871).

BRUMAIRE, brü'mär' (Fr. from *Lat. bruma*, winter). The second month in the Republican calendar of France. It extended from October 22 to November 20 in the years I-III and V-VIII; from October 23 to November 21 in the years IV, VIII-XI, XIII and XIV; and from October 24 to November 22 in the year XII. The celebrated 18th Brumaire of the year VIII, which witnessed the overthrow of the Directory and the elevation of Napoleon as First Consul, corresponds with Nov. 9, 1799, of the Gregorian Calendar. See **CALENDAR**; **FRANCE**.

BRUMEL, brü'mel, ANTON. One of the most

important music masters of the school of the Netherlands, a pupil of Okeghem. Of his life absolutely nothing is known beyond the single fact that in 1505 he changed his residence from Lyon to Ferrara. He wrote exclusively sacred works, masses, motets, and magnificats, many of which were printed between 1503 and 1539. Numerous manuscripts are scattered in the libraries of Rome, Milan, Bologna, Basel, Vienna, and Munich.

BRUMIDI, bröo-mé'dé, CONSTANTINE (1805-80). An Italian decorative painter, active chiefly in America. He was born in Rome, where he studied painting, becoming a member of the Academy of St. Luke at the age of 13. He painted frescoes in the Vatican under Gregory XVI, besides adorning other palaces of his native city. When Rome was occupied by the French in 1849, he came to America and was naturalized in the United States in 1852. The first frescoes painted here, those of the Capitol at Washington, begun in 1859, were the work of his hand. They represent "The Apotheosis of Washington" and various scenes from American history, in addition to work of an allegorical character. He also decorated churches in Philadelphia, in the city of Mexico (1852), and died in Washington. From a purely decorative point of view, the work of Brumidi and his Italian assistants is tolerable, and better than anything else of the kind ever done at that time in the country. But his workmanship is indifferent, his figures devoid of content.

BRUMMAGEM. A corruption of the name of Birmingham (q.v.), England. Of the many ways of spelling the name of this city, the oldest is that given in *Domesday-Book*, viz., Birmingham. This was corrupted into Brummagem, a term which has become synonymous with worthless wares having a glittering exterior, since various kinds of cheap sham ware, especially jewelry, are manufactured in Birmingham.

BRUMMAGEM JOE. A name contemptuously given by his political opponents to the Rt. Hon. Joseph Chamberlain.

BRUMMELL, GEORGE BRYAN (1778-1840). An Englishman of wealth and fashion, called "Beau Brummell." He was born in London, son of Lord North's private secretary, and was celebrated as an exquisite even at Eton and during a short stay at Oriel, Oxford. He became an intimate companion of the Prince of Wales, afterward George IV, and was looked upon as the "glass of fashion and the mold of form." For many years he was regarded by the court society as an oracle upon all matters of dress and etiquette. While his fortune lasted, or the Prince of Wales furnished the means, he kept an elegant establishment in London; but he finally lost his royal friends, became poor, gambled recklessly, fled from his creditors in 1816, and died in the Asylum du Bon Sauveur, a hospital for the mendicant insane, in Caen, France, where he had been British Consul in 1830-32. Bulwer's *Pelham* is said to be founded on Brummell's life. Consult Jesse, *Life of George Brummell, Esq.* (new ed., London, 1885); and Boutet de Monvel, *Beau Brummell and his Times* (ib., 1908).

BRUNANBURH, bröo'nán-burk. The scene of Æthelstan's victory over the Scotch and Irish in 937. The battle, which probably took place in some part of Northumbria, is celebrated in a ballad in the Anglo-Saxon Chronicle.

BRUNCK, bröŋk, RICHARD FRANÇOIS PHILIPPE (1729-1803). A distinguished French classical scholar, born in Strassburg, Dec. 30, 1729. He was educated under the Jesuits in Paris, but abandoned his studies, and for some time was engaged as a military commissary during the Seven Years' War. A professor in Giessen, with whom Brunck happened to lodge while the army was in winter quarters, revived in him the love of classical studies, so that on his return to Strassburg he devoted all his spare time to Greek, and soon distinguished himself as an able but audacious critic and emendator. His belief that all inaccuracies in ancient Greek writings were introduced by copyists often led him astray, in that he "emended" texts without regard to the manuscript tradition; but, in spite of this, he did good service to Greek literature.

His first work, *Analecta Veterum Poetarum Græcorum* (1772-76), an edition, in 3 vols., of epigrams from the Greek Anthology, the Bucolic poets, and Callimachus, was followed by editions of Anacreon (1778-86), Apollonius Rhodius (1780), Aristophanes, with Latin translation (1781-83), Gnostic Poets (1784), Vergil (1785), seven plays of Euripides, and Sophocles, with Latin translation (1786-89). The last of these established a new era in the criticism of the tragic writers. The outbreak of the French Revolution interrupted Brunck's studies. He ardently attached himself to the popular side. During the Reign of Terror he was imprisoned at Besançon, but was liberated after the downfall of Robespierre. His means, however, had been so much reduced that he was compelled to sell his valuable library. From this time (1801) he turned his attention from Greek to Latin literature and published editions of Vergil (1785), Plautus (1788), and Terence (1797). He died June 12, 1803.

BRUNDISIUM, or **BRUNDISIUM**. See **BRINDISI**.

BRUNE, brūn, GUILLAUME MARIE ANNE (1763-1815). A French marshal of the First Empire, born at Brives-la-Gaillarde. He became a journalist and a participant in the Revolutionary movement, taking part with Danton (q.v.) in the establishment of the Cordeliers Club. After the conquest of Belgium he was sent as civil commissioner to that country, but soon entered the military service. In 1796 he was in the army of Italy, where his abilities advanced him to the rank of division general. In 1798 he was sent to organize the Helvetic Republic, and after accomplishing his mission was appointed to command the army of Holland, where he enhanced his military reputation. In September and October, 1799, he defeated the English and Russian forces, and compelled the Duke of York, commander of the allied armies, to accede to the humiliating capitulation of Alkmaar. After distinguishing himself in La Vendée and subsequently in Italy, he was sent on a mission to the Sublime Porte. In 1804 he was made a marshal, and the Legion of Honor was conferred upon him. As Governor-General of the Hansa towns he subdued Swedish Pomerania. In 1814 Brune transferred his allegiance to Louis XVIII but became again a partisan of Napoleon. He was murdered by a Royalist mob at Avignon, Aug. 2, 1815.

BRUNEAU, brü'nō', ALFRED (1857-). A French composer. He was born in Paris, March 3, 1857. He entered the Paris Conserva-

tory in 1873, where he studied under Francomme ('cello), Savard (harmony), and Massenet (composition). In 1881 he won the *Prix de Rome* with his cantata *St. Geneviève*. His first opera, *Kérin*, was given in 1887, a second one, *Le Réve*, in 1892. He won a real and lasting success with his next work, *L'attaque du moulin*, in 1893, which made the round of the German opera houses, and was also heard at the Metropolitan Opera House in New York (1910). *Messidor* (text by Zola, 1897), *Ouragan* (1901), and *L'enfant roi* (1905) met with little success. For two other operas, *Nais Micoulin* and *La faute de l'abbé Mouret*, both performed in 1907, Bruneau wrote his own text. He also wrote a Requiem, two concert overtures, and the symphonic poems, *La belle au bois dormant* and *Penthesilea*, which are frequently heard. Bruneau also acted as critic for several Paris journals and won distinction as a writer on music. He published *Musique de Russie et musiciens français*, *Musique d'hier et de demain*, *La musique française*, and *La musique russe*. Consult A. Herve, *Alfred Bruneau* (London, 1907).

BRUNEL, brōŋ-nŭ'. The most important town of the state of the same name in British Borneo, situated on the north coast of the island, above the mouth of the river of Brunei (Map: East Indies, D 4). It is built partly over the water and is exceedingly unhealthy. There is some trade with Singapore, and there is railway communication with the interior. Pop. (est.), 10,000.

BRUNEL, ISAMBARD KINGDOM (1806-59). An eminent English engineer, son of Sir Marc Isambard Brunel. He was born in Portsmouth and was educated at the Collège Henri Quatre, in Paris. His first practical engineering work was under his father, then engaged in constructing the Thames Tunnel. Brunel early began the designing of bridges, and several suspension bridges were built from his plans. He is best known, perhaps, as the designer and civil engineer of the *Great Western*, 1838, the first steamship built for regular transatlantic service; of the *Great Britain*, 1845, the first ocean screw steamer; and of the *Great Eastern*, 1858, for many years the largest vessel in the world. In 1833 Brunel was appointed chief engineer to the Great Western Railway, and designed and constructed the tunnels, bridges, viaducts, and arches for this line and its branches, giving the road a gauge of 7 feet. He designed many docks at English seaports, including those of Monkwearmouth, Plymouth, Briton Ferry, and Milford Haven. In 1842 he was employed by the government to construct the Hungerford suspension bridge across the Thames at Charing Cross, London. In 1850-53 he constructed the works of the Tuscan portion of the Sardinian railway system.

BRUNEL, SIR MARC ISAMBARD (1769-1849). An English engineer, who constructed the Thames Tunnel. He was born at Hacqueville, near Gisors, France. He early showed an inclination for mechanics, preferring the study of the exact sciences to the classics. After leaving school he served in the French navy for six years, and in 1793, forced to leave France on account of his political opinions, he came to America. He settled in New York as civil engineer and architect and was engaged in a number of important surveys, including that of a canal between Lake Champlain and the Hudson River. He prepared a set of plans for the

Capitol in Washington, which, while accepted, could not be carried out on account of the expense involved: he also designed and constructed the Bowers Theatre in New York, which was burnt in 1821. He was appointed chief engineer of New York and prepared plans for the defenses of the city. He went to England in 1799 and there made a number of inventions. His method for making ships' blocks was acquired by the English government and resulted in the saving of much money. He also invented other wood-working machinery, as well as machines for making shoes, knitting, and other mechanical and manufacturing processes. His most noteworthy achievement was the Thames Tunnel, whose construction was commenced on plans devised by Brunel in 1825. In spite of many disasters this work was successfully carried through, and the tunnel was opened in 1843. The strain, however, proved too much for his health, and he survived the completion of the work but a few years.

BRUNELLESCHI, brō'nēl-lēs'kē, or **BRUNELLESCHI**, FILIPPO (c.1377-1446). The founder of Renaissance architecture. He was born in Florence, and first learned the art of a goldsmith; next, that of a sculptor; and finally, architecture. He competed in 1401 for the bronze doors of the baptistery of Florence, but was vanquished in the famous contest by Ghiberti (q.v.); the panel of the "Sacrifice of Isaac," which he presented, is preserved. He was a realist in sculpture, as is shown, among other works, by his Crucifix. His goldsmith's work was good and somewhat akin to Gothic work; witness his share in the altar front in the Opera del Duomo. Having decided to study architecture and ancient ruins, he went to Rome with his young friend, Donatello (q.v.), who became afterward the leader in Renaissance sculpture. His residence in Rome during the greater part of the years between 1401 and 1417 was largely spent in studying, drawing, and measuring the ancient Roman buildings, many of which were then in comparatively good preservation, before the vandalism of the Renaissance had begun. In these studies he seems to have sought to master the Roman systems of construction and the secrets of the grandeur and beauty of the Roman style in order rather to introduce these qualities into the architecture of his day, than to inaugurate a textual revival or reproduction of Roman forms. In 1417 he returned to Florence as his permanent residence, and when it was proposed to complete the Gothic cathedral of Santa Maria del Fiore by the construction of the dome, he was one of the famous architects who presented models in the competition. Brunelleschi was able to demonstrate not only how defective all the other proposed domes were, but that his own was the only solution. He was at first hampered by Ghiberti, a great sculptor but an incompetent architect, who was associated with him, but he soon became sole director. Brunelleschi's dome was epoch-making—an octagonal double-shell dome, crowned by a lantern, and measuring 139½ feet in internal diameter. Begun in 1420, it was completed in 1461, from his designs. It was the greatest feat of mechanical skill then attempted in Italy. At almost the same time Brunelleschi began the church of San Lorenzo (1420), for which he adopted a modification of the basilica (q.v.) type, with domical vaulting over the side aisles and a pendentive dome

over the crossing. Two dome-vaulted sacristies at the east end were the only portion completed before his death, but his design was followed in the final edifice. Much later, in 1436, he commenced another basilica, Santo Spirito, which he did not have the opportunity to carry out. But the gem of his art, in which both conception and execution were his, is the Pazzi Chapel in the court of the church of Santa Croce (1429), in the form of an oblong hall surmounted by a dome, with a rectangular domed apse and a charming vestibule with dome and tunnel vault. The second cloister of Santa Croce, the Badia at Fiesole, the Loggia degli Innocenti, the Palazzo di Parte Guelfa, are proofs of his leadership in Florentine architecture up to the time of his death. His final masterpiece, begun in 1444, was the Pitti Palace, the most impressive and ruggedly majestic of Italian palaces. In its present form it shows many later additions to the original design, but preserves its aspect of colossal scale and power. Brunelleschi trained several great architects who took up the work and carried it forward; chief of them was Michelozzi (q.v.). For his biography consult: Manetti, edited by Moreni (Florence, 1812); Fabriczy (Stuttgart, 1872); Scott (London, 1901); Baxter (New York, 1901). Consult also Anderson, *Architecture of the Renaissance in Italy* (London, 1906).

BRUNELLO. A baron in the suite of King Agramant, in Ariosto's *Orlando Furioso*. He is a lying dwarf, whom Bradamant outwits, and Agramant himself finally hangs, despite the interference of the enchantress, Marphisa. The character also occurs in Boiardo's *Orlando Innamorato*.

BRUNER, LAWRENCE (1856-). An American entomologist, born at Catasauqua, Pa. He graduated at the University of Nebraska, became an assistant on the United States Entomological Commission in 1880, was field agent for the United States Department of Agriculture at the University of Nebraska in 1888, and in Argentina in 1897-98. At the University of Nebraska he became instructor in entomology in 1890 and professor in 1895. He is author of *The Destructive Locust of Argentina* (2 reports, 1898 and 1900); *Locusts of Paraguay* (1906); *South American Tetrigidae* (1912), and is joint author of a *New Elementary Agriculture* (9th ed., 1911).

BRUNET, brū'nā', JACQUES CHARLES (1780-1867). A French bibliographer, born in Paris. He published a supplement to Duclos's *Dictionnaire bibliographique des livres rares* (1790), and in 1810 a widely used *Manuel du libraire et de l'amateur des livres* (3 vols.; 5th ed., 6 vols., 1860-65; ed., with 3 supplemental vols., by Deschamps and Brunet, 1870-80). His works also include, besides many excellent catalogues, *Nouvelles recherches bibliographiques pour servir de supplément au manuel* (3 vols., 1834), and *Recherches et critique sur les éditions originales de Rabelais* (1852).

BRUNETIÈRE, brūn'tyār', FERDINAND (1849-1906). The greatest systematic critic of modern French literature. He was born in Toulon; he studied there and in Paris, and first came into prominence in 1875 by critical work in the *Revue des Deux Mondes*, a journal of which he afterward became the editor (1895). In 1886 he was made professor of literature at the Ecole Normale in Paris, in 1887 member of the Legion of Honor, and in 1893 lecturer

at the Sorbonne, and member of the Academy. In 1897 he lectured in the United States and afterward attracted wide attention through his increasing zeal for Roman Catholicism as opposed to the tenets of the "intellectuels" of France. Like his contemporaries, J. K. Huysmans, Paul Bourget, and George Moore, he found materialism repellant, and in a famous phrase spoke of "the bankruptcy of science." His philosophical point of view shifted from a materialistic to an idealistic pessimism. His literary criticism shows an immense and minute learning, apparent objectivity, and an impressive logical synthesis, manifested in a style always keen and cutting, often superciliously contemptuous; for though outwardly impersonal, his criticism is in fact strongly prejudiced. Hence he is more popular with the public than with his fellow critics, who find him more intent to "classify, weigh, and compare than to enjoy or help others to enjoy" (Lemaître). His greatest service to the study of literature has been to place the classical and romantic periods in true perspective with the eighteenth century and the present day. Throughout he sees, with Taine, a natural evolution in literary tradition, although he accords greater play to individuality. Even the "Naturalists," Zola, the Goncourts, and other of his pet abominations, are grudgingly admitted to have been of service in "drawing our writers from the cloudy summits of old-time romanticism to the level plains of reality." Among his noteworthy works is his marvelously condensed *Manuel de l'histoire de la littérature française* (Paris, 1897; New York, 1899). Other important works are: *Evolution des genres dans l'histoire de la littérature*, vol. i (1890), a history of criticism; *Les époques du théâtre français* (1892); *L'Evolution de la poésie lyrique en France au XIX^e siècle* (1894); and *Le roman naturaliste* (1883). Volumes of essays are collected under various titles, as *Nouvelles questions de critique* (1890); *Histoire et littérature* (1884-86); *Études critiques sur l'histoire de la littérature française* (1880-98); *Discours académiques* (1901); *Nouveaux essais sur la littérature contemporaine* (1904). In the same year he began the publication of a history of French literature between 1515 and 1830 under the title *Histoire de la littérature française classique*, in 5 vols.; and in 1905, he put forth his *Sur les chemins de la croyance*. In 1906 he wrote a careful study of Balzac (Eng. trans., Philadelphia, 1907). Consult the appreciation of Brunetière by Jules Lemaître in *Mes contemporains* (1887 et seq.); Sargent, *Les grands convertis* (Paris, 1906); Babbitt, *The Masters of Modern Criticism* (Boston, 1912).

BRUNFELS, brōn'fēls, Otto (1488-1534). A German physician and botanist, born in Mainz. He became a member of a Carthusian community near there, but subsequently turned Protestant, and was pastor in Steinheim and Neuenburg. Ultimately he abandoned his pastoral office, studied medicine, and died as a physician in Bern. He has been called the "Father of Botany" because of his *Contrafayt Kreuterbuch*, in which he described the native plants of Germany for the first time. This was the first of the series of "herbals" that were the characteristic botanical publications of the sixteenth century, describing the local plants without any attempt at classification, and chiefly without any botanical terminology. His

works also include *Herbarum Vivæ Icones* (1530 and 1536), and *In Dioscoridis Historiam Plantarum Certissima Adaptatio* (1543).

BRUNHES, bru'nyās', JEAN (1869-). A French geographer. His publications include: *Étude de géographie humaine—L'irrigation, ses conditions géographiques, ses modes et son organisation dans la Péninsule Ibérique et dans l'Afrique du Nord* (1902); *La géographie humaine, essai de classification positive, principes et exemples* (2d ed., 1912), with 272 drawings and maps; *Réunion et Creusement de dépressions puis comblement et disparition vers une région de moindre résistance* (1912).

BRUNHILDA, or **BRUNHILDIS** (c.550-613). Queen of Austrasia and the daughter of Athanagild, King of the Visigoths. Brunhilda was wedded to Sigibert I of Austrasia, while her sister, Galswintha, became the wife of Sigibert's brother, Chilperic, King of Neustria. Fredegunda (q.v.), the former concubine of Chilperic, soon recovered her ascendancy over the King and caused Galswintha to be murdered in 567. Brunhilda determined to avenge herself on Fredegunda, and the annals of the next half century in Gaul are filled with the bloody deeds provoked by the enmity of the two women. Brunhilda and her husband were successful at first, until Sigibert was murdered in 575 at the instigation of Fredegunda. Brunhilda herself was captured by Chilperic, but her beauty gained over Merovig, the son of Chilperic, who made her his wife and assisted her to escape. Merovig was put to death by his father, but Brunhilda returned to Austrasia and governed in the name of her son, Childebert I. Murders and wars continued, however, as long as Brunhilda was alive, for she exercised the real power in the kingdom, in the name of her son and grandson. Finally, the armies of Austrasia were overthrown in 613 by Clotaire II, son of Fredegunda; the aged Queen was taken captive and for three days subjected to insult and torture, then bound to a wild horse and dragged to death. Brunhilda was beautiful, accomplished, devout, an able ruler, a founder of churches, hospitals, and monasteries; but in her revenge she was implacable, and the wars which she brought about undermined the power of the Merovingians. Consult Kurth: "La Reine Brunehaut" in the *Revue des Questions historiques*, vol. xxvi (1871).—Another **BRUNHILDA** is the heroine of the Norse legend of Sigurd or Siegfried, traces of which are found in the *Nibelungenlied*. In the earliest versions she is a Valkyrie and is rescued from a rocky peak surrounded by flames, on which she lies in enchanted sleep, by Sigurd, who bears her off and marries her, but, under the influence of sorcery, forsakes her. In her jealousy Brunhilda causes him to be murdered and immolates herself on his funeral pyre. Later she was made a queen of superhuman strength, who was won only by magic power; but in this guise she played only a minor part. Consult Gildersleeve, "Brunhilda in Legend and Literature" in *Modern Philology* (vol. 6, pp. 343-374, Chicago, 1909). See **NIBELUNGENLIED**.

BRUNI, brō'nē. A long, irregular island southeast of Tasmania, lying south of Storm Bay and D'Entrecasteaux Channel. Area, 149 square miles. It is divided by a narrow isthmus into North and South Bruni Islands. The latter has a revolving light 335 feet above sea level and contains coal mines.

BRUNI, JOSEPH ANTOINE. See **ENTRECASTEAUX.**

BRUNI, LEONARDO (1369-1444). An Italian humanist, born at Arezzo, and hence styled "Aremino." He was one of the most learned men who flourished during the epoch of the revival of Greek learning in Italy. He first studied law in Florence and Ravenna, but afterward turned his attention to classical literature. In Rome he was papal secretary under four Popes, and in 1414 attended John XXIII to the Council of Constance. On the deposition of that Pope he returned to Florence, where he was of service to the Republic in several important matters. His history of Florence (Strassburg, 1610) procured for him the rights of citizenship, and in 1427 the Medici appointed him Chancellor of the Republic. He aided in advancing the study of Greek literature mainly by his literal translations into Latin of Aristotle, Plato, Demosthenes, Plutarch, and others. In addition to historical works, his *Epistole* (ed. 1472) are specially important, together with his lives of Dante and Petrarch in Italian (1672). For his linguistic ideas, consult Trabalza, *Storia della grammatica italiana* (Padua, 1908); the *History of Florence* in Italian (Venice, 1865); *History of Goths* in English (London, 1865); *Life of Dante* in English by Wicksteed (London, 1898).

BRÜNIG (brü'ník) **PASS.** A pass in the Swiss Alps, on the frontier line between the cantons of Bern and Obwalden (Map: Switzerland, C 2). It lies at an altitude of about 3400 feet and is crossed by a road leading from Lucerne to Brienz, constructed in 1857-62. Since 1889 a railroad line through the pass has given an easy route between Obwalden and the Brienz valley of Bern.

BRUNIQUEL, brü'né'kél (usually traced back to Queen Brunhilda or Brunehaut). A prehistoric station in Tarn-et-Garonne, France, where were found in great abundance the peculiarly chipped stone implements characteristic of the Magdalenian epoch of prehistoric archaeology. Consult Mortillet, *Le préhistorique* (Paris, 1900), for numerous references.

BRUNTEES, SIR JAMES (1816-92). A Scottish civil engineer, born in Kelso. He studied at Edinburgh University, in 1838 became assistant engineer in the building of the Bolton and Preston Railway, one of the first in England, and subsequently assistant to Sir John Hawkshaw on the Lancashire and Yorkshire system. He constructed the São Paulo Railway of Brazil, the Mont Cenis summit railway (1865), the Mersey Railway, with the tunnel between Birkenhead and Liverpool, which was built in 1880-86, and in which Sir Douglas Fox was joint engineer, and the Avonmouth docks for Bristol (1866-77). He was one of three engineers who reported in 1868 on a tunnel under the English Channel, was president of the Institution of Civil Engineers in 1882-83, and was knighted in 1886.

BRÜNN, brun (Czech *bruno*, OCh. Slav. *brunije*, mud. Slav. *brn*, loam, clay, whence a section of Altbrunn still bears the name Lehmstätte, mud city). The capital of the Austrian Crownland of Moravia, beautifully situated at the confluence of the Schwarzwawa and the Zwittawa, at the foot of the Spielberg, in lat. 49° 12' N. and long. 16° 40' E., 89 miles by rail north of Vienna (Map: Austria, E 2). The fortifications, which until 1860 surrounded the

old town, have been converted into pleasant promenades and handsome boulevards. Among the most interesting buildings of Brünn are the cathedral of St. Peter and St. Paul, built in the fifteenth century; St. James's Church, a Gothic edifice, with a tower over 300 feet in height, magnificent stained-glass windows, containing the tomb of Count Radwit, the defender of the town in 1645 against the Swedes; the church of the Minorites, with handsome frescoes; and the church of the Capuchins, with the grave of Colonel Trenck. Among the notable secular buildings may be mentioned the Landhaus (the hall of the provincial Diet, opened in 1881), the Rathaus (1511), the Episcopal Palace, a museum, and a handsome synagogue. At the summit of the Spielberg stands the Citadel, once the prison in which the Pandour leader, Colonel Trenck, died in captivity in 1749, and where the Italian author, Count Silvio Pellico, was detained a prisoner from 1822 to 1830. Brünn is the seat of a United States consular agent. The city's affairs are administered by a municipal council of 48 and an executive board of 11 members. The city owns its water works and operates gas and electric light plants. Brünn is one of the most important manufacturing cities in Austria-Hungary. It is particularly noted for its woolen industry. There are also manufactures of cotton, silk, leather, machinery, chemicals, beer, spirits, sugar, flour, and hardware. Its railway facilities are excellent, and a steam tramway accommodates local traffic. Pop., 1890, 94,500; 1900, 108,900; 1910, 125,737.

History.—Old Brünn dates back to the ninth century, though the new town was founded 500 years later. In 1278 Brünn became a free Imperial city. The city has experienced numerous sieges, from the period of the Hussite wars to the Austro-Prussian War of 1866; it withstood the Hussites in 1428, King George of Bohemia in 1467, the Swedish General Torstenson in 1645, the Prussians in 1742.

BRUNN, HEINRICH VON (1822-94). A German archaeologist, born at Wörlitz, in Anhalt. After studying at the University of Bonn, as a pupil of Welcker and Ritschl, he assisted in the work of the German Archaeological Institute at Rome (1843-53). He was lecturer on archaeology at Bonn (1854-56), secretary of the Archaeological Institute at Rome (1856-65), and professor of archaeology at the University of Munich (from 1865 until his death). He was the pioneer in the analysis of artistic style. In addition to articles on Greek painting and Etruscan art, contributed to philological and archaeological reviews, his publications include: *Geschichte der griechischen Künstler* (2d ed., 1889); *I rilievi delle urne etrusche, I. Ciclo troico* (1870); *Griechische Götterideale* (1893). Consult Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

BRUNNEN, bröön'nen (Ger. well, mineral spring). A village and port in the Canton of Schwyz, Switzerland, on the Lake of Lucerne, near the mouth of the Muotta, at the southeastern bend (Map: Switzerland, C 2). The town has much of the lake traffic, and also is a popular health resort. It is celebrated in history as the place where the deputies of the forest cantons laid the basis of the Helvetic Republic after the battle of Morgarten. Pop., 1900, 3200.

BRUNNER, ARNOLD WILLIAM (1857-1925). An American architect. He was born in New

York and studied at the College of the City of New York and at the Massachusetts Institute of Technology. For a time he was in the office of George B. Post, architect. Mt. Sinai Hospital and the Columbia School of Mines (New York), as well as important buildings in Cleveland and other cities, were designed by him, and he was more recently selected as the architect for the new building of the Department of State, Washington. He also drew city plans for Cleveland, Baltimore, and Rochester, N. Y. In 1902 he was a member of the New York board of education, and in 1908-10 served on the city's art commission; he helped to found the Architectural League, of which in 1903-04 he was president, and was chosen an Associate of the National Academy of Design, president of the New York chapter of the American Institute of Architects (1909 and 1910), and a member of the National Institute of Arts and Letters (1913). He is author of numerous magazine articles and of *Interior Decoration* (1887; 1891).

BRUNNER, brōn'ēr, HEINRICH (1840-1915). A German jurist and legal historian of distinction born at Wels, Austria. After studying at the University of Vienna he became a professor successively at Lemberg (1866), Prague (1870), Strassburg (1872), and Berlin (1873). His contributions to the study of Frankish, German, Norman and Anglo-Norman law are of the first importance and have given him high rank among legal historians. He was the first to demonstrate the influence exercised by the primitive legal institutions of the Franks through the Normans upon the English system of trial by jury. Among the titles of his works are: *Zeugen- und Inquisitions-heurceis der karolingischen Zeit* (1866); *Die Entstehung der Schwurgerichte* (1872); *Deutsche Rechtsgeschichte* (1887-92); *Forschungen zur Geschichte des deutschen und französischen Rechts* (1894); *Grundzüge der deutschen Rechtsgeschichte* (1901; 5th ed., 1912).

BRUNNER, SEBASTIAN (1814-93). An Austrian Roman Catholic theologian and author. He was born in Vienna, studied there, and was ordained priest in 1838. In 1848 he founded the *Wiener katholische Kirchenzeitung*, which he edited until 1865, and from 1853 to 1865 he was university preacher in Vienna. In 1865 he became apostolic prothonotary and prelate of the papal household. In his writings he was didactic, militant, and voluminous. Among his Ultramontane polemics are a satire in verse, *Der Nebeljungen Lied* (1845; 4th ed., 1891), directed against the Hegelians, and *Der deutsche Hiob* (2d ed., 1846). His *Gesammelte Erzählungen und poetische Schriften* appeared in 1864-77. For his biography, consult Scheicher (Vienna, 1888).

BRUNNER'S GLANDS (after J. C. Brunner, German anatomist). Small glands of the compound tubular variety (see GLAND) lying in the submucous coat of the duodenum. The tubular acini are lined with columnar epithelium, which secretes a serous fluid. The ducts pierce the muscularis mucosæ and open upon the surface of the mucous membrane between the villi. See INTESTINE.

BRUNNOW, brūn'nó, PHILIPP, COUNT (1797-1875). A Russian diplomat, born in Dresden. He studied at the University of Leipzig and entered the diplomatic service in 1818. He took part in the congresses of Troppau and Laibach, acted for one year as secretary to the Russian Embassy in London, attended the Congress of

Verona, and then occupied for a time a high office in St. Petersburg. In 1840 he was accredited Ambassador to London. After the outbreak of the Crimean War he represented Russia in Frankfort and, with Count Orloff, was sent to the Congress of Paris in 1856. Immediately after the treaty of peace had been concluded, he was sent on a special mission to London to reestablish friendly relations between the courts of St. Petersburg and St. James. He was afterward appointed to the court of Prussia, but in 1858 he returned to his old place in London. He represented Russia at the conferences in London in 1864 and 1871. In recognition of his services he was made a count by the Czar in April, 1871. In 1874 he retired to Darmstadt, where he died in the following year.

BRUNO, brō'nó, FILIPPO GIORDANO (1548-1600). An Italian philosopher. He was born at Nola (hence often called "the Nolan"), in the Kingdom of Naples, and entered at an early age the Order of Dominicans; but later, when he expressed doubts in regard to some Church doctrines, he was obliged to flee from his convent (c.1576). Henceforth his life was unsettled by reason of the theological and philosophical hostility he aroused wherever he stayed. He first went to Geneva, where he spent two years, then to Venice, Padua, Brescia, Milan, Genoa, Toulouse, Paris, London, Oxford, Marburg, Wittenberg, Prague, Helmstadt, Frankfort-on-the-Main, Zurich, Padua, and back to Venice. In many of these places he occupied professorial chairs or delivered courses of lectures, as in Toulouse, Paris, Oxford, Wittenberg, and Helmstadt. It was in England, under the protection or the French Ambassador, that he composed his most important works (1583-85). In Venice, in 1592, he was arrested by officers of the Inquisition and conveyed to Rome in 1593. He was now subjected for seven years to persecution and imprisonment in the vain hope that he would recant; but when all the endeavors of his enemies proved ineffectual, he was given over to the civil authorities for final correction, with the request that he "be punished as lightly as possible and without bloodshed." He told his judges that probably they feared the sentence they pronounced more than he. He died at the stake, Feb. 17, 1600. In 1889, under papal protest, a monument was erected on the spot where he had met his death. His published writings, of which the most valuable are composed in Italian, display throughout a strong, courageous soul, susceptible of deep enthusiasm, and laboring to attain the truth. *La cena delle ceneri*, or, 'Evening Conversations on Ash Wednesday,' is an apology for the Copernican astronomy; the *Spaccio della bestia trionfante*, or 'Expulsion of the Triumphant Beast' (Paris, 1584), is a satirical allegory in the style of the times.

His greatest works are metaphysical, such as the *Della causa, principio, ed' uno* ('Of Cause, Principle, and the One') and *Del infinito, universo, e mondi* ('Of the Infinite, the Universe, and Worlds'). The doctrine enunciated in these is pantheistic and was perhaps inspired by that of Nicolas of Cusa (q.v.), who was himself decidedly Neo-Platonistic. Bruno held that there is no form without matter, and as a spirit or soul is form, it can exist only in material embodiment. There is an all-life, animating the whole universe, which is thus one living being with life in all its members. This all-life is God, also called *natura naturans*, who manifests

himself in the visible world, or *natura naturata*. In God all the seeming inconsistencies of the sensible world are harmonized (*coincidentia oppositorum*). This thought of the oneness of the universe led Bruno to expand the Copernican view of astronomy, which in its founder's thought regarded only the solar system, and to make it take in all creation, which is thus regarded as a system of innumerable worlds, each with its own sun, each having developed out of a primitive indefiniteness to its present form, and each destined to decay and dissolve. Every part of this universe is instinct with the life of the whole. The ultimate irreducible parts are called monads, which are eternal, both spiritual and corporeal; and they are atoms, subject to mathematical laws on the corporeal side.

In logic Bruno was an opponent of the Aristotelian theory, as interpreted by the scholastics, and was an ardent champion of "the Lullian art" (see LULLY, RAYMOND), which he greatly improved. He rejected the syllogism as yielding no new truth, and emphasized the necessity of studying things rather than analyzing conceptions.

Bruno's philosophy, more or less ignored for about 300 years, was, however, in essentials the same pantheism which found expression in Böhme and in Spinoza. Among later thinkers Schelling and Hegel were much indebted to him. Original editions of Bruno's works are very rare. His writings in Italian were published by Wagner (Leipzig, 1830) and by Lagarde (Göttingen, 1888). All his Latin writings were published in Naples and Florence (1879-91). An Eng. trans. of a part of *The Cause, Principle, and the One*, by J. and K. Royce, is given in Rand's *Modern Classical Philosophers* (Boston and New York, 1908). Consult: Bartholomæus, *Jordano Bruno* (Paris, 1846); Frith, *Life of Bruno the Nolan* (London, 1887); Berti, *Documenti intorno a Giordano Bruno di Nola* (Rome, 1880); Sigwart, *Die Lebensgeschichte Giordano Brunos* (Tübingen, 1880); Mariano, *Giordano Bruno: La vita e l'uomo* (Rome, 1881); Brunnhofer, *Giordano Bruno's Weltanschauung und Verhängnis* (Leipzig, 1882); Carriere, *Die philosophischen Weltanschauung der Reformationszeit* (Leipzig, 1887); Pater, *Gaston de Latour* (London, 1896); J. L. McIntyre, *Giordano Bruno* (London, 1903), which contains a bibliography; Elton, "Giordano Bruno in England," in *Modern Studies* (New York, 1907); Reiner, *Giordano Bruno und seine Weltanschauung* (Berlin, 1907); Gramzow, *Giordano Bruno, der erste moderne Mensch* (Charlottenburg, 1912).

BRUNO, SAINT (c.1030-1101). The founder of the Carthusian Order of monks. He was born in Cologne and received his earliest education in the school attached to the Collegiate Church of St. Cunibert, in that city. Subsequently he studied in Rheims, where he distinguished himself so greatly that Bishop Gervasius appointed him in 1057 director of all the schools in his diocese. Bruno, however, soon began to be troubled by the wickedness of his time, and, anxious to escape from what seemed to him the general pollution, he took refuge, along with six pious friends, in a desert place, 14 miles north of Grenoble, and there, in 1084, founded the Order of the Carthusians (q.v.), so called from the monastery, now known as La Grande Chartreuse. The present building was erected after the last fire in 1676. Bruno and his companions

had each a separate cell, in which they practiced the severities of the rule of St. Benedict, keeping silence during six days of the week, and seeing one another only on Sundays. Pope Urban II, who was one of Bruno's most eminent scholars, in 1090 summoned the saint to Rome to be his adviser. Bruno obeyed the call reluctantly and steadily refused all offers of preferment. He was the companion of Urban in his flight to the Campagna from the threatened onslaught of the Emperor Henry IV and shortly after (1094) established a second Carthusian monastery, called La Torre, in a solitary district of Calabria, not far from Squillace, on the bay of the same name, and there died, Oct. 6, 1101. He was canonized by Leo X in 1514. Bruno left no written regulations for his followers. These first made their appearance in a complete form in 1581 and were enjoined on all Carthusians by Pope Innocent IX. Consult: Tappert, *Der heilige Bruno* (Luxemburg, 1872); Lübbel, *Der Stifter des Cartäuser Ordens* (Münster, 1899); Gorse, *Saint Bruno, fondateur de l'ordre des Chartreux* (Paris, 1902). A *Life* in French, by a monk of the order, appeared at Montreuil-sur-Mer (1898).

BRUNO'NIAN SYSTEM OF MEDICINE. See BROWN, JOHN.

BRUNO THE GREAT (c.925-965). Archbishop of Cologne, and Duke of Lorraine, one of the most eminent men of his time. He was the third son of Henry I, the Fowler, and the brother of Otho I, Emperor of Germany. Balderich, Bishop of Utrecht, was his instructor, and at an early age he became noted for surprising knowledge, sagacity, and eloquence which secured for him an immense influence over the bishops and clergy. On the other hand, his liberality, meekness, and great earnestness of heart won the affections and reverence of the laity. Summoned by Otho to the Imperial palace in 939, he quickly assumed an influential position among the chroniclers, poets, and philosophers of the court. In 940 he became Imperial Chancellor. He accompanied Otho to Italy in 951 and honorably distinguished himself by his fidelity to his brother, when Otho's own son, Conrad, and others of his kindred rebelled against him. As a reward, the Emperor appointed him Archbishop of Cologne and Duke of Lorraine in 953. Bruno died at Rheims, Oct. 11, 965. He wrote a commentary on the Pentateuch, and several lives of saints. For his life, consult Pfeiffer (Cologne, 1870); Martin (Jena, 1878); Mittag (Berlin, 1896).

BRUNS, bröns, Ivo (1853-1901). A German classical scholar and professor in the University of Kiel. He was born in Halle, May 20, 1853, and was the author of *Plato's Gesetze, etc.* (1880); *Lucrezstudien* (1884); *Litterarische Porträte der Griechen* (1896); *Persönlichkeit der Geschichtsschreibung der Alten* (1898); etc.

BRUNS, KARL GEORG (1816-80). A German jurist. He was born in Helmstedt and studied in Göttingen, Heidelberg, and Tübingen. He was professor of law at the University of Berlin from 1861 to 1880. Several of his works on jurisprudence are justly celebrated. They include: *Das Recht des Besitzes im Mittelalter und in der Gegenwart* (1848), a work worthy of being ranked with that of Savigny; and *Fontes Juris Romani Antiqui* (1860; 7th ed., 1909). Consult Degenkolb, *Karl Georg Bruns* (Freiburg, 1881).

BRUNS, VICTOR VON (1812-83). A German surgeon, born in Helmstedt. He studied in Bruns-

wick, Tübingen, Halle, and Berlin, and after practicing in Brunswick visited Vienna and Paris, to perfect himself in the science of surgery. In 1843 he accepted the position of professor of surgery at Tübingen. He wrote numerous scientific treatises and was an authority on diseases of the larynx, winning the medical prize of 20,000 marks offered by the Academy of Turin with his work on the surgical treatment of the larynx. Among his publications are: *Handbuch der praktischen Chirurgie* (2 vols., 1854-60); *Die Durchschneidung der Gesichtsnerven beim Gesichtsschmerz* (1859); *Die Laryngoskopie und laryngoskopische Chirurgie* (1865); *Die Amputation der Gliedmassen durch Zirkelschnitt mit vorderr Hautlappen* (1879).

BRUNSWICK, brünz'wík. A city, port of entry, and the county seat of Glynn Co., Ga., 68 miles (direct) south-southwest of Savannah, on St. Simon's Sound, 8 miles from the ocean, and on the Atlanta, Birmingham, and Atlantic, the Atlantic Coast Line, the Southern, the Georgia Coast and the Piedmont railroads (Map: Georgia, E 4). It is connected also by steamship lines with New York, Boston, and other points on the Atlantic coast. Brunswick is popular as a summer and winter resort, and among the points of interest are the United States government building, the city hall, Oglethorpe Hotel, Glynn Academy buildings, Jekyl Island Club (the "Millionaire's resort"), the historic St. Simon's Island, Cumberland Island, the burial place of "Light Horse Harry" Lee, the site of Dungeness Castle of the Carnegies, and the Shell Boulevards, 20 miles in length. The city has a fine harbor, and exports cotton, tar, rosin, turpentine, crosssties, and pine lumber. Truck gardening, fishing, and oyster and vegetable canning are important industries, and there are box, handle, cigar, and carriage factories, machine shops, foundries, lumber mills, and bottling, copper and cement stone works. There is also a large turpentine and rosin refinery having a capacity of 700,000 gallons of turpentine and 108,000 barrels of rosin a year. Under a revised charter of 1900 the government is vested in a mayor, elected every two years, and a municipal council, chosen on a general ticket. Brunswick was settled as early as 1735 by James Oglethorpe (q.v.). Pop., 1900, 9081; 1910, 10,182; 1920, 14,413.

BRUNSWICK. A town in Cumberland Co., Me., including Brunswick Village, at the head of navigation on the Androscoggin River, and on the Maine Central Railroad (Map: Maine, C 5). It is 9 miles west of Bath, and opposite Topsham, with which it is connected by bridges. Good water power is afforded by the falls of the river at the head of tidewater. The town manufactures cotton goods, brass ferrules, pulp, flour, canned goods, boxes, and wooden specialties, meal, feed, swings, etc. It is the seat of Bowdoin College (q.v.), the Medical School of Maine, and has a public library. Brunswick was settled in 1628 and originally was called Pejepscot. The town of Brunswick was incorporated in 1717, and the village in 1836. It was while living here that Harriet Beecher Stowe wrote *Uncle Tom's Cabin*. Pop., 1900, 6806; 1910, 6621. Consult Wheeler, *History of Brunswick, Topsham, and Harpswell, Including the Ancient Territory Known as Pejepscot* (Boston, 1878).

BRUNSWICK. A town in Frederick Co., Md., 44 miles (direct) northwest of Washington,

D. C., on the Baltimore and Ohio Railroad, on the Chesapeake and Ohio Canal, and on the Potomac River (Map: Maryland, G 3). Large shops of the Baltimore and Ohio Railroad are located here, and there is a casket factory. The town is governed by a mayor and six councilmen, elected biennially, and owns its water works. Pop., 1900, 2471; 1910, 3721.

BRUNSWICK (Ger. *Braunschweig*). One of the federal states of the German Empire. It is bounded mainly by Prussian territory (provinces of Hanover, Saxony, and Westphalia), with a total area of 1418 square miles (Map: Germany, D 2). The southeast part belongs to the region of the Harz Mountains and rises in some places over 3000 feet. The northern portion is only slightly elevated and is mainly hilly. Brunswick belongs almost entirely to the basin of the Weser. The soil is mostly well cultivated and productive, due in great part to the division of the land into very small holdings.

Agriculture is the leading occupation; over 50 per cent of the total area is arable land, about 9 per cent meadow, and 30 per cent forest. In 1912 the area under rye was 33,796 hectares, wheat 31,739, oats 34,012, hay 32,649, and potatoes 19,830. Various vegetables, fruits, and sugar beets are important crops. Cattle raising is carried on only in connection with agriculture, but the live-stock returns for the last few years show a large increase. At the end of 1912 there were about 33,000 horses, 122,000 cattle, 95,700 sheep, 222,800 swine, and 52,400 goats. The mineral industries are important. Lignite, iron, asphalt, lead, and copper are the principal minerals, and the total annual output of mine and furnace is about 25,000,000 marks (\$5,950,000).

The manufactures of Brunswick are diversified. There are extensive sugar mills and refineries, cigar and cigarette factories, hat factories, machine shops, chemical works of different kinds, glass works, some weaving mills, and a number of breweries and distilleries. The main domestic exports are metals, textiles, hats, liquors, and building stone. There are over 300 miles of railway lines.

Brunswick is a constitutional duchy. It is hereditary in the house of Brunswick-Lüneburg by primogeniture. Up to 1913 the heir, the Duke of Cumberland, was excluded, owing to the refusal to renounce claim to the throne of Hanover. In that year Brunswick was given back to him, when he met this condition. The constitutional government dates from 1830, although the constitution was not adopted until 1832. As amended in 1899, the constitution provides for a Diet of one chamber, composed of 48 members, 15 elected by the towns, 15 by the rural communities, 2 by the Protestant clergy, 4 by the landed aristocracy, 3 by the manufacturing interests, 4 by the professional classes, and 5 by the highest-taxed citizens. Members of the Diet serve for four years. Brunswick has 2 votes in the Bundesrat and 3 representatives in the Reichstag. The executive is represented by a responsible ministry (Staatsministerium) of 3 members. For purposes of local administration Brunswick is divided into 6 circles, administered by directors. Revenue is obtained chiefly by taxation and by the exploitation of state domains. The budget is voted for a period of two years, the estimates for education not being embraced in the general budget. For the year 1912-13 the budget showed an estimated revenue of 14,964,413 and 14,961,518 marks. The public

debt on Aug. 31, 1912, was 45,173,991 marks; assets amounted to 37,644,003 marks, so that the actual debt was 7,529,988 marks.

Education is in the hands of a special commission. The technological school in Brunswick, however, is under the immediate charge of the ministry. There are about 439 elementary schools, mostly in the rural districts, and a considerable number of secondary and trade schools. The military forces of Brunswick are now combined with those of Prussia, but are controlled to some extent by the regent. In 1880 the population was 349,367; in 1890, 403,773; in 1900, 464,433; in 1910, 494,339. Of the latter number there were 464,235 Protestants, 25,828 Roman Catholics, and 1757 Jews. The capital is Brunswick (q.v.). Consult O. Doering, *Braunschweig* (Leipzig, 1905); Loewe, *Bibliographie der hannoverschen und braunschweigischen Geschichte* (Posen, 1908); Hohnstein, *Geschichte des Herzogtums Braunschweig* (Braunschweig, 1908). For the history of the duchy, see BRUNSWICK, HOUSE OF.

BRUNSWICK (Ger. *Braunschweig*, mediæval *Brunswich*, *Bruneswik*, for ML. *Brunonis vicus*, the village of Bruno, son of Rudolf, Duke of Saxony; cf. Eng. *wick*, AS. *wic*, town, MHG. *wich*, Goth. *weihis*, village). A city, capital of the German duchy of the same name, situated on the Oker, about 35 miles southeast of Hanover, and in lat. 52° 16' N. and long. 10° 32' E. (Map: Germany, D 2). The town is irregularly built, and its crooked and narrow streets lend it a mediæval appearance, although its fortifications, dismantled in 1797, now give place to parks and promenades. The most noteworthy of the churches are the cathedral, a Romanesque structure, founded by Henry the Lion about 1173, and containing the tombs of Henry and his consort; the church of St. Catharine, begun by him in 1172 and completed in 1500; the church of St. Magnus, the original of which was built in the eleventh century; and the church of St. Martin, dating from the twelfth century and enlarged in the thirteenth, fourteenth, and fifteenth centuries. Among the secular edifices, one of the most prominent is the ducal palace, erected in 1831-36 on the site of the Graue Hof and reconstructed after the fire of 1865. It has an imposing façade, surmounted by a fine quadriga in copper. The Altstadt Rathaus (town hall of the old town) is a fine Gothic building, begun in 1250 and completed in 1468. Its façade, having open arcades and pillars, is adorned with the statues of Saxon princes. Among other interesting edifices are the Dankwarderode, in Romanesque style, the Gewandhaus, now occupied by the chamber of commerce, the new town hall (1895-1900), and the ministry of finance, the last two in early Gothic.

The chief industries comprise the manufacturing of chicory, tobacco, woollens, paint, machines, chemicals, articles of apparel, sugar, liquors, etc.

The city administration is carried on by a municipal council of 36 members and an executive board of 8 members. Brunswick owns its water works, gas plant, a slaughterhouse, and markets. A municipal sewage farm has been in operation since 1897. The city is well provided with educational institutions, among which are a technical high school established in 1745, and several special schools and teachers' seminaries. The Ducal Museum contains fine Dutch paintings and etchings, as well as antique

and mediæval curiosities. There are also a municipal museum and a theatre. Pop., 1890, 101,047; 1900, 128,226; 1910, 143,552. Most of the inhabitants are Lutherans.

Brunswick is supposed to have been founded in the second half of the ninth century. It obtained municipal privileges from Henry the Lion, by whom it was also strongly fortified. A member of the Hanseatic League, Brunswick became one of the most important cities of northern Germany; but its prosperity did not outlive that of the league. In the seventeenth century began a decline, to which the Thirty Years' War contributed. During 1806-13 Brunswick belonged to the Kingdom of Westphalia. In 1830 it was the scene of a revolution, which resulted in the flight of the reigning duke.

BRUNSWICK, DUKE OF. See CHARLES, FREDERICK AUGUSTUS WILLIAM.

BRUNSWICK, HOUSE OF. Henry the Lion, of the house of Guelph, one of the great vassals of Frederick Barbarossa in the twelfth century, was the founder of this house. He held the old Saxon duchy and Bavaria, but lost all save his allodial possessions, Brunswick and Lüneburg, through his rebellious conduct. His son Otho was German Emperor, as Otho IV. Otho the Child, a grandson of Henry the Lion, was recognized as the first Duke of Brunswick in 1235. The history of the house of Brunswick in the course of the next four centuries presents a bewildering succession of divisions, reunions, and ramifications. Ernst the Confessor, Duke of Lüneburg, who lived at the time of the Reformation, and who introduced Protestantism into his little state, may be regarded as the progenitor, through his grandson Augustus, of the modern elder ducal line of Brunswick (Brunswick-Wolfenbüttel) which became extinct in 1884, and, through his son William, of the new younger ducal line of Brunswick-Lüneburg (house of Hanover). Ernst Augustus, Duke of Brunswick-Lüneburg, who married Sophia, a granddaughter of James I of England, was raised to the dignity of ninth Elector of the Empire in 1692. His son, George Louis, succeeded to the crown of Great Britain in 1714. (See ENGLAND and HANOVER.) The ducal residence, which had been at Wolfenbüttel, was in 1754 removed to Brunswick by Duke Charles, who founded the famous Collegium Carolinum, and was a faithful ally of England during the Seven Years' War. He died in 1780. His brother Ferdinand was the ablest of the lieutenants of Frederick the Great, turned the tide of battle at Prague, and won the battles of Crefeld and Minden. The son and successor of Duke Charles, Charles William Ferdinand, was nephew of Frederick the Great, and married Augusta, daughter of George III of England. He fought in the Seven Years' War and played an important part at the battle of Crefeld in 1758. In 1792 he was commander of the allied armies of Austria and Prussia against France. He marched into Champagne, but was compelled to conclude an armistice with Dumouriez, after trying in vain to force the position at Valmy. In 1806 he was called to lead the Prussian troops against Napoleon, who defeated him decisively at Auerstädt; he retired, broken-hearted, and died soon afterward from the effect of his wounds. Napoleon incorporated his duchy with the new Kingdom of Westphalia, but after the battle of Leipzig it was restored to his son, Frederick William, who had distinguished himself in the campaigns of 1792, 1793, 1806, and

who fell at the head of his troops at the battle of Quatre-Bras in 1815. His son, Charles Frederick, was a minor, and up to 1823 George IV of England acted as Prince Regent. The people of Brunswick endured the misrule of Charles Frederick for seven years; then they revolted and drove him from his duchy in 1830. He died childless in Geneva, in 1873. By an act of the Germanic Diet the duchy was transferred to his brother William, Prince of Oels (born in 1806), who assumed the government April 25, 1831. He died childless in 1884, and the succession passed to the Duke of Cumberland, son of George V, the dethroned King of Hanover. As the heir refused to recognize the new constitution of the German Empire, the Imperial government declined to allow the succession to take place, and an interregnum occurred. In October, 1885, Prince Albert, a nephew of the Emperor William I, was elected Regent of the duchy by the Diet. On his death, in 1906, the Duke of Cumberland offered to renounce the succession for himself and his eldest son, on condition that his second son, Ernst August, should succeed. This offer was refused, and the Duke of Mecklenberg made Regent. However, in 1913, as a result of the marriage of Ernst August with the daughter of the Emperor of Germany, Brunswick was given back to the groom on condition of renouncing all claim over Hanover. Consult: Halliday, *Annals of the House of Hanover* (London, 1826); Fitzmaurice, *Charles William Ferdinand, Duke of Brunswick: An Historical Study* (London, 1901); Heinemann, *Geschichte von Braunschweig und Hanover* (Gotha, 1882-92).

BRUNSWICK BLACK. A varnish employed for coating coarsely finished iron grates, fenders, etc. It is mainly compounded of bitumen, lampblack, and turpentine, and when applied with a brush, quickly dries and leaves a shining jet-black surface. A similar composition of finer quality for finer work is known as Berlin black.

BRUNSWICK GREEN. A name applied to several different substances. It has been used, in the first place, to denote a green pigment obtained by heating, in a closed vessel, a solution of ammonium chloride with copper filings, separating the resulting pigment from metallic copper by washing, and then slowly drying it. As thus obtained, the pigment is a copper oxychloride, essentially similar to the mineral *atacamite*, which was originally found in Chile. Another use of the name is to denote the pigment precipitated by the addition of ammonium carbonate to a solution of alum and copper sulphate. Lighter shades of this pigment may be produced by adding barium sulphate or alum. At present, however, the name "Brunswick green" is generally applied to mixtures of Prussian blue and chrome yellow.

BRUS, THE. See BARBOUR, JOHN.

BRUSA, brō'sā, or **BROUSSA** (anciently, *Lat. Prusa*). A town of Asiatic Turkey, the capital of the vilayet of the same name, situated at the foot of Mount Olympus, about 20 miles from the sea of Marmora (Map: Turkey in Asia, C 2). The town is divided into several parts by a mountain stream, spanned by a number of bridges. It has an old ruined castle in the centre, and while its streets are not very wide or straight, the town has a very neat and picturesque appearance. Mosques are numerous, and some of them—as, e.g., the Ulu Jami—pos-

sess architectural beauty. There are also a number of fine baths, khans, and bazaars, which are well stocked with European goods imported from Constantinople. In Brusa and its vicinity are the tombs of several of the early sultans and of a large number of Turkish notabilities. About a mile west of the town are found four hot sulphur springs used for bathing. The industrial importance of Brusa is considerable. It produces silk goods and garments of a very high reputation in the Eastern markets, exported also to Lyons. The port of Brusa is Mudania, with which it is connected by a railway line about 20 miles long. Brusa has a population of between 85,000 and 90,000, of whom two-thirds are Turks.

Brusa was built by Prusias II, King of Bithynia. In 1327 Orkhan, son of Othman, the second Sultan of Turkey, captured it and made it the capital of his Empire, and it continued so until the Sultan Amurath I, the successor of Orkhan, removed the capital to Adrianople. The Tatars plundered it in 1402. It has suffered much from fire and earthquakes. Consult Wilson, *Constantinople, Brusa, and the Troad* (London, 1893). See KHODAVENDIKYAR.

BRUSASORCI, brō'sā-sōr'chē. See RICCIO, DOMENICO.

BRUSH. This term is used in electricity, first, to describe a particular form of discharge from an electrical machine (q.v.), and, second, as the name of the device by which contact is established between the commutator, or other revolving part of a dynamo or motor, and the conductors leading to the line. The brush discharge from a static machine takes place when the machine is in operation, but no sparks are drawn from the collector, and is in the form of a brush of pale-blue light, visible in a darkened room, and accompanied by a faint hissing or crackling. It occurs at the brass ball which is farthest distant from the collecting comb, and appears very similar to a tree with its branches and ramifications. The shape of the brush varies with the shape of the conductor where the discharge takes place and has been examined by means of revolving mirrors (see CHRONOGRAPH) and found to consist of a series of partial sparks. In the case of a dynamo or motor the brushes are either bundles of strips of copper or gauze or blocks of carbon, which press against the commutator or collecting rings and complete the circuit through the line. They will be found described and illustrated in the article DYNAMO-ELECTRIC MACHINERY.

BRUSH, CHARLES FRANCIS (1849—). An American inventor, born in Euclid, Ohio. He graduated, in 1869, at the engineering department of the University of Michigan, and was an analytical chemist in Cleveland, Ohio, from 1870 to 1873. From 1873 to 1877 he was in the iron industry. He perfected in 1876 the dynamo-electric machine known by his name, and not long after the "series" arc lamp, which might with uniform results be used in circuit in large numbers. Since that time he has patented more than 50 other inventions, chiefly detailed improvements on the two preceding. He founded in Cleveland the Brush Electric Company, which controlled his American patents, and in 1899 received the Rumford medal. He was president of the Cleveland Chamber of Commerce in 1909-10.

BRUSH, EDWARD NATHANIEL (1852—). An American physician. He was born at Glen-

wood, Erie Co., N. Y.; graduated in 1874 at the University of Buffalo; was editor of the *Buffalo Medical Journal* in 1874-79, and assistant physician at the State Lunatic Asylum, Utica. From 1884 to 1891 he was assistant at the Pennsylvania Hospital for the Insane, Philadelphia, and in the latter year became physician in chief and medical superintendent of the Sheppard and Enoch Pratt Hospital, Baltimore, Md. He was associate editor of the *American Journal of Insanity* from 1878 to 1884 and again assumed that post in 1897. He has written much on insanity.

BRUSH, GEORGE DE FOREST (1855-). An American figure and portrait painter. He was born in Shelbyville, Tenn., Sept. 28, 1855, and was a pupil of Gérôme in Paris. Public notice was first attracted to his work, in 1883, by his pictures of Indian life in the West, such as "The Silence Broken," "The Sculptor and the King," "The Indian and the Lily," and "The Moose Chase" (National Gallery, Washington). After his later visits to Paris his work was more strictly confined to figure composition, portraying mother and child, or children, in somewhat the manner of the early Renaissance painters. His models are nearly always his wife and children, and he calls such subjects "Family Groups." Among his awards were gold medals at the expositions of Chicago (1893), Paris (1900), Buffalo (1901), and St. Louis (1904). He was elected to the Society of American Artists and to the National Academy of Design (1906), and also to the American Academy of Arts and Letters. His canvases are composed with great care. His work seems little affected by the new school of light and air, but remains faithful to the older traditions of "seeing" and of the manipulation of pigment. His recent works include "The Artist" and "Mother and Child" (1900), "Family Groups" in the Museum of Boston, the Metropolitan Museum, New York, the Pennsylvania Academy of Fine Arts, Philadelphia, and the Corcoran Gallery, Washington, "Mother Reading to Children" (1906); "A Little Cavalier," "Mary," "Head of Miss Tribbie" (Roland C. Lincoln, Boston, Mass.). His work includes many admirable portraits. Part of the time he resides at Fiesole, outside of Florence, his American home being at Dublin, N. H.

BRUSH, GEORGE JARVIS (1831-1912). An American mineralogist, born in Brooklyn, N. Y. He graduated at Yale in 1852 and later studied in Munich and Freiberg. In 1855 he became professor of metallurgy in the Yale, now Sheffield, Scientific School, exchanging this chair for that of mineralogy in 1864. He was director of the scientific school from 1872 to 1898. He contributed much to the *American Journal of Science* and similar periodicals and published a *Manual of Determinative Mineralogy* (1875; 15th ed., 1899).

BRUSH and BROOM (*brush*, OF. *broche*, *brosse*, bush, brushwood, possibly akin to AS. *byrst*, OHG. *burst*, Ger. *Borst*, bristle; and see *BROOM*). A brush is an instrument for sweeping or rubbing surfaces, either to remove dirt or to apply some material, as paint or blacking. It is composed of a bunch or bunches of fibrous and flexible material attached to a handle or back. A broom is simply a long-handled brush. These familiar instruments are of very ancient origin, for they are mentioned in the writings of Homer. They are used for a great variety of purposes

and are made from an indefinite number of materials. Among the commoner materials used in their manufacture are bristles, feathers, whalebone, and rubber, the hair of the camel, Russian squirrel, badger, bear, and goat, rattan, split cane, broom corn, and coir. The last-named material, which is simply the husk of the coconut palm, is largely superseding hog's bristles for the coarser kind of brushes.

Brushes are said to be simple when they consist of a single tuft, and compound when they consist of a series of tufts. The crudest form of all is the ordinary paintbrush, in which the handle is forked at the end and a bunch of bristles is inserted between the two prongs, which are then bound together with twine and secured with a coating of glue. Artists' paintbrushes are made from camel's or Russian squirrel's hair; the roots are forced into a quill which has been soaked previously and which on drying holds them fast.

In making the cheaper grades of compound brushes, such as floor and scrub brushes, dusters and blacking brushes, the tufts of bristles, coir, or whatever the material used, are simply stuck into holes bored in a piece of wood. These holes may be bored at an angle, so that the tufts will project outward. The root ends are dipped in melted pitch, bound with thread, and then dipped again and inserted with a twisting motion. In the finer grades of brushes the tufts are tied in the middle with wire or thread, which is drawn up through the hole piercing the wood, and are secured by interweaving at the back. A veneer is then glued or cemented on the back to cover the wires. The best brushes are trepanned—that is, the holes are driven longitudinally or transversely through the back, and other holes sunk to meet them on the face of the brush. The tufts are then tied in the middle with strong threads, which are drawn through the holes piercing the brush, after which the holes running transversely or longitudinally through the brush are plugged. Brushes are made by machinery, and many different devices for their construction have been invented. In the Woodbury process—an American invention and one of the earliest in brush manufacture—the back of the brush is trepanned, and as the holes do not go clear through the wood, an extra back is not required. This machine consists essentially of a metal comb of uniform thickness, filled with bristles which are held in the middle, so that one-half of the bristles appear above the surface of the comb and the other half beneath. The comb thus charged moves in guideways and discharges bristles from each division successively into a channel in which they are brought into a horizontal position and a proper quantity taken up to form a tuft. This tuft is moved along an inclined cylinder, when a plunger doubles the bristles into a loop, which is seized by wire and in an instant securely fastened.

Brooms for sweeping floors, and whisk brooms for brushing clothes, are produced in large quantities in the United States, where they are made from broom corn (q.v.), a staple agricultural product of the Middle West that represents a crop valued at about \$5,000,000 per annum. In addition, in 1913, 187 tons of broom corn valued at \$14,720 were imported in 1913 and 1346 tons valued at \$157,969 in 1912. Broom-corn growing and broom making are both carried on in a small way by hundreds of farmers and manu-

facturers, and the bulk of the work is still done by hand, or with the aid of simple machinery. Large manufacturers, however, employ steam sewing machines. The broom corn or brush is received at the shop in bales. It is first run through sizing machines, to separate the fibres into groups according to length. In the large shops the broom is tied into bundles and bleached or dried to give it the desired color. The broom handles are essentially simply turned sticks, which are sandpapered, varnished, painted, or otherwise finished to suit the trade. Whisk brooms, however, often have fancy handles of bone, celluloid, or even such costly materials as silver and ivory. In making the broom the fibres are placed around the end of the stick or handle and secured by wire in a simple winding machine. The broom at this point is conical. The next step is to flatten it to shape in a vise and secure it in that form by sewing it with twine. This may be done by hand or by power; in either case the broom is held in a vise while being sewed. To remove the portion of seed left on the broom by the harvester, it is run through a scraping machine, between rolls or cylinders containing pegs or wires. The brooms are then trimmed; tin, plush, or velvet guards are placed over the wiring; labels are affixed, and the completed brooms bunched in dozens. In the cheaper grades of brooms the sticks are plain and the guards are omitted. Besides brooms, many other varieties of brushes are made from the broom corn.

According to the United States census of manufactures for 1909, published in 1912, the number of establishments producing brushes was 390 and the sale value of the product of that year \$14,694,000, with an average profit of \$4879 for each establishment.

Revolving brooms, for sweeping streets, began to be used as early as 1835. The modern carpet sweeper (q.v.) is a form of revolving broom. Besides the commoner types of brushes and brooms already described, there is an endless variety constructed in special shapes and used for special purposes.

The accompanying table gives the foreign trade of the United States in brushes and brush materials. See BRISTLES.

VALUE OF FOREIGN TRADE OF THE UNITED STATES IN BRUSHES AND BRUSH MATERIALS COMPILED FROM THE STATISTICAL ABSTRACT FOR 1912 AND MONTHLY SUMMARY OF COMMERCE FOR JUNE, 1913

YEAR ENDING JUNE 30TH	IMPORTED									
	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
Crude Bristles.....	\$10,976	\$4,054	\$9,389	\$5,325	\$7,620	\$7,637	\$12,987	\$9,803	\$14,796	\$12,583
Prepared Bristles..	2,356,325	2,966,444	2,686,357	3,256,552	2,090,157	2,583,482	3,111,872	2,970,481	3,032,231	3,491,980
Brushes.....	1,372,227	1,306,446	1,357,114	1,586,556	1,681,640	1,430,321	1,732,200	2,241,066	2,067,149	2,089,303
	EXPORTED									
	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
Broom Corn.....	\$226,179	\$227,066	\$240,164	\$268,812	\$266,696	\$304,522	\$424,484	\$363,644	\$461,110	\$389,219
Manu- factures of										
Brooms & Brushes..	275,522	327,083	366,103	415,733	488,392	494,681	604,469	757,181	693,223	183,643 *486,292

* Previously included in Brooms and Brushes.

AIR BRUSH. This device, while in no sense a brush, is used extensively in artistic work and especially in connection with processes for reproduction. It consists of an atomizer with a fine jet or hollow needle through which a solution of a pigment or other liquid material may be sprayed upon the work in hand. The instrument is connected with some source of air under

pressure by means of a flexible rubber tube, and the amount of the pigment sprayed upon the ground can be controlled by the operator. It gives a uniform field or tone, and is especially useful in retouching photographs for reproduction by the half-tone process as well as for the preparation of original drawings or paintings.

BRUSH BIRDS. Birds of the family Atrichidae, inhabiting the scrub of Australia.

BRUSH TURKEY (so called because it lives in brush or scrub). An Australian bird (*Catheturus*, or *Talegalla, lathamii*), one of the largest and best known of megapodes. See MOUND BIRD.

BRUSSELS (Fr. *Bruxelles*, Flem. *Brussel*, ML. *Brosella*, later *Bruocella*, *Bruælla*, from MHG. *bruoch*, Ger. *bruch*, marsh, bog, AS. *brōc*, stream, Eng. *brook* + Lat. *sella*, seat, Bruocella having been the residence of the Duke of Lotharingia, or Lorraine, in a marshy locality). The capital of Belgium, as well as of the Province of Brabant, situated in the centre of the country, on the river Senne (Map: Belgium, C 4). The city is divided into the upper and the lower town. The former is the fashionable part of the city, and is essentially modern in its appearance, the French language being chiefly spoken; the latter town, devoted mainly to business, still retains some of the original Flemish picturesqueness, together with the Flemish tongue. The municipal authorities are as deeply concerned with the artistic aspect of the capital as with the acquisition and control of the municipal works. As a result, Brussels, with its magnificent parks, well-shaded boulevards, and splendid squares, is considered one of the finest cities in Europe, and justly deserves the name "Petit Paris." It was formerly surrounded by strong walls, which have been converted into broad avenues and pleasure grounds. The Allée Verte—a double street along the Scheldt Canal—forms a splendid promenade, and leads towards the palace of Laeken, the suburban residence of the royal family, 3 miles north of the city. Besides these outer boulevards, which encircle the city, are several inner boulevards, constructed at a considerable expense. In the upper town the most magnificent park is near the royal palace. Of the

city squares, the most noteworthy are the Place Royale, with its colossal monument of Godfrey of Bouillon; the Grande Place, in which is the Hôtel de Ville, where in 1568 the patriot counts, Egmont and Horn, were beheaded by order of the Duke of Alba; the Place des Martyrs, with a memorial erected to those who fell in the revolution of 1830; the Place du Grand Sablon, with

its adjacent Place du Petit Sablon, ornamented by an inclosure containing several statues of scientists and authors; the Place du Congrès, having a column 146 feet high, surmounted by a bronze statue of King Leopold I; and the Place Sainte-Gudule, containing the famous church of the same name.

Among the ecclesiastical buildings, the church (sometimes erroneously called the cathedral) of Sainte-Gudule ranks first. It is an imposing structure in early Gothic style, begun about 1220, on the site of an old church. It is famous chiefly for its magnificent windows of stained glass, belonging to different periods since the thirteenth century. The two towers on both sides and the statuettes of the portal are of a recent date. Notre Dame des Victoires or du Sablon was originally constructed in the early fourteenth century, was completely rebuilt in the fifteenth and sixteenth centuries, and is now being restored. Other prominent churches are Notre Dame de Finistère and St. Jacques sur Caudenberg, with a copper-roofed belfry. The finest specimens of architecture, however, are found in the secular edifices of Brussels, among which the Hôtel de Ville comes first. It is in the Gothic style, and its façade, fronting the market, is profusely adorned with statuary. In the centre rises the tower, 370 feet, surmounted by a gilt statue of St. Michael, the city's patron saint. The front part of the building dates from the fifteenth century; the rear portion was reconstructed in the eighteenth century, after the French had destroyed the original structure in 1695. The royal palace stands south of the park, and contains pictures by Rubens, Vandyke, and Frans Hals. On the north side of the park is situated the Palais de la Nation, erected at the close of the eighteenth century for the Council of Brabant. It is now used by the Senate and the Chamber of Deputies. The Palais des Académies, formerly belonging to the Prince of Orange, is in the Italian style and houses the Académie Royale des Lettres, Beaux-Arts et Sciences, and the Académie Royale de Médecine. The Palais d'Arenberg dates from the sixteenth century and has a picture gallery containing examples of Rubens, Vandyke, Rembrandt, Teniers, and Frans Hals. The largest structure of modern times is the Palais de Justice, begun in 1866 and inaugurated in 1883, on the occasion of the fiftieth anniversary of Belgium's independence. It is in the Græco-Roman style and covers a site 590 feet by 560. Pyramidal in shape, it culminates in a dome with a cross. Brussels has a number of markets, and the Place Grande contains several guild houses devoted to the use of various trades.

Administration. The capital is administered by a burgomaster, assisted by five assessors. The municipal council has 29 members, elected for 6 years. Brussels owns its telephone lines, electric plant, water and gas works, all of which it operates at a considerable profit; while by the sale of the city's garbage one-fourth of the cost of its collection is recovered. The street railways, run by electricity, are owned by private companies, which, however, are under the strict control of the municipal government. The sanitary conditions of the city are being constantly improved, and the death rate shows a satisfactory decline. In 1910 the municipal revenue amounted to 49,431,884 francs (including extraordinary 13,893,602) and the expenditure to 49,418,536 (15,140,553 extraordinary).

The municipal debts of Brussels were consolidated in 1886 into a single debt of 289,000,000 francs, payable in 90 years; in 1903 it was 280,400,000 francs.

Education. Among the numerous educational establishments the university (q.v.), with its splendid library, stands first. There are also an academy of medicine, a veterinary school, a military school, a conservatory of music, numerous scientific and art associations, and an academy of art. The Royal Library, founded in 1838, had, at the end of 1911, 529,823 volumes, 30,092 manuscripts, 181,663 engravings, prints, and maps, and 76,798 coins and medals. The Palais des Beaux-Arts is a classical building, completed in 1880, and devoted mainly to paintings and sculpture. It contains about 600 paintings of the old Flemish school, and a gallery of modern Flemish art numbering about 350 canvases. Among the theatres the most important is the Théâtre de la Monnaie, built in the beginning of the sixteenth century and devoted to opera.

In industry and commerce Brussels occupies a secondary position. The chief manufactures are laces (for which this city has long been famous), furniture, metal, and leather goods. It is the centre of the national railway system and is connected with different parts of Belgium by two canals. The population of Brussels was 152,828 in 1856, 162,498 in 1880, 183,686 in 1900, and 177,078 (80,552 men, 96,526 women) Dec. 31, 1910 (census). It is in the Brussels agglomeration, containing, in addition to the town, 13 suburban communes, that the rapid increase of population is apparent—250,593 in 1856, 421,131 in 1880, 599,076 in 1900, 720,347 in 1910. The foreign element, especially natives of France, is very prominent.

The hamlet of Brussels (swamp dwelling) first sprang up in the seventh century, round a chapel erected by St. Gerald, on an island in the Senne. About 1050 it became a cathedral town and some centuries later the capital of Brabant. It was a flourishing commercial centre and acquired extensive municipal rights, in defense of which it fought bitterly against the dukes of Burgundy, into whose possession it came in 1430. Mary of Burgundy brought the town to her husband, Maximilian I. Under Charles V Brussels was made the court residence in the Netherlands, and became afterward, under Philip II, the chief scene of the Revolution and of the atrocities committed by the Duke of Alba and the Inquisition. It surrendered to Alexander of Parma in 1585. Brussels suffered greatly in the war of Spain against Louis XIV, in whose reign it was bombarded by Marshal Villeroi, and in that of Austria against Louis XV; but still more from the continual prevalence of party animosities caused by the policy of Austria. Under the mild rule of Maria Theresa Brussels flourished greatly, and in this time many of its best institutions and public buildings were founded. In 1789 occurred the Brabant Revolution, under Joseph II, and scarcely had Austrian rule been reestablished, after a brief time of independence, when Brussels fell into the hands of the French, under Dumouriez (1792). After other changes of fortune Brussels, with the other parts of Belgium, was incorporated with the Kingdom of the Netherlands in 1815, and so remained until the Revolution of 1830, when, after a four days' murderous struggle between the soldiers and populace in the streets of the town, the inde-

pendence of Belgium was declared, and Brussels was made the capital of the kingdom. Consult Hymans, *Brüssel* (Berlin, 1910).

BRUSSELS, UNIVERSITY OF. A Belgian university which derives its chief interest from the fact that it was founded without coöperation of either state or church and is in that respect unique in continental Europe. The Revolution of 1830 destroyed the old University of Louvain, already shattered by the French wars. The Liberal party, under the lead of Theodore Verhaeghen, in 1834 established, largely by private subscription, in its place the Free University of Brussels. This and the number of students at first proving insufficient to maintain the new foundation, as a result of further efforts more money was secured from private sources. The city of Brussels and the Province of Brabant subsidized the institution, and the city further gave it a building. In 1912 the university had 1338 students, divided among the faculties of philosophy, law, mathematics and science, medicine, pharmacy, and a polytechnic school. It comprises also a school of political and social science, organized in 1889 and enlarged soon after by absorbing the Salvay Institute, an institute having unusual facilities for research and experimentation. This university is an important centre of extension work and, through the *Union des anciens Etudiants*, extends timely aid to struggling students. Its publications include the *Revue de L'Université*, a periodical which records the scientific and other progress of the various faculties. Its library numbers 80,000 volumes. Consult Goblet d'Alviella, *L'Université de Bruxelles pendant son troisième quart de siècle 1884-1909* (Brussels, 1909).

BRUSSELS CAR/PET. See CARPET.

BRUSSELS CONFERENCE. An important international conference of the Powers of Europe held in Brussels, Belgium, July 27, 1874. It was called on the suggestion of the Russian Emperor, with a view to ameliorate and render more humane the rules and usages of war. The United States did not send a representative, and Great Britain sent but one, after notifying the Powers that she opposed any consideration of the rules of naval warfare by the conference. All of the leading nations of Europe were represented. A draft code, or *projet*, was prepared by Russia and submitted to the other governments before the meeting, with the understanding that it should be freely discussed, and that, in case a unanimous conclusion was reached, a new declaration, embodying the opinion of Europe thus manifested, should be published by the Powers.

Upon many topics the representatives were agreed, but upon others the differences of opinion were found to be irreconcilable. There was general unanimity as to the definition of combatants, noncombatants, and spies; as to the legitimate means of injuring an enemy; concerning the conduct of sieges and bombardments, the treatment of prisoners of war, as well as of the sick and wounded, flags of truce, capitulations, and armistices.

The representatives could not agree, however, as to what constitutes hostile occupation of invaded territory. The view taken by England and some other states was that a territory was not to be deemed occupied by an invader, unless he had force enough to repress any insurrection; while Germany and other states contended that it was enough if the invading army had broken down organized opposition and had complete

control for a time, even though it had advanced to other sections. Another point of difference related to the right of a people to rise *en masse* and oppose invaders, even though not organized as a part of a regular military force. Here, again, England sided with the small states and refused to concur in a policy which, in her opinion, would tend to paralyze patriotic resistance by the masses of an invaded nation.

Although the conference fell far short of accomplishing the purpose for which it was called, it marks an important advance in international law. See HAGUE PEACE CONFERENCE; BELLIGERENT; INTERNATIONAL LAW, and the authorities there referred to.

BRUSSELS LACE (so named as it is chiefly made in Brussels). A pillow lace (see LACE) made with a hexagonal net having four twisted and two plaited sides. Much of the modern Brussels lace is simply a pillow-lace pattern appliquéd in a machine net. (See BOBBINET.) The best Brussels lace is of a very fine linen thread, which was formerly spun in damp cellars, for if handled in the dry air it is likely to break; the spinner depends chiefly on her sense of touch for making the thread even. The difficulty and unhealthfulness of the work naturally made the fabric rare and costly. The rarest qualities have a needlework ground called *point à l'aiguille*. It is said that a choice piece of Brussels lace passes through the hands of seven different workers, each of whom has her special department and does not know what the final pattern will be.

BRUSSELS SPROUTS. A cultivated variety of *Brassica oleracea*, distinguished by producing in the axils of the leaves buds or cabbage-like heads an inch or more in diameter. These heads or "sprouts" are prepared like cabbage or cauliflower for the table. The plant is grown as a fall crop and is cultivated in much the same manner as cabbage. Some varieties attain a height of 4 feet and produce sprouts on nearly the whole length of the stem. The plant takes its name from Brussels, Belgium. See CABBAGE.

BRUT, brōt. A work by Layamon (c.1200), chronicling in 32,000 verses the wanderings of Brutus the Trojan and the early legends of British history after his advent. The work is an amplified version of the French *Brut* of Wace, which in turn is taken from Geoffrey of Monmouth. The British Museum contains the two manuscripts of the work. See WACE.

BRU'TA. See EDENTATA.

BRUTT, brut, FERDINAND (1849-). A German genre and historical painter. He was born in Hamburg and studied at Weimar under F. Pauwells and Albert Bauer. In 1876 he went to Düsseldorf, where in 1893 he was made professor in the Academy, and about 1900 he removed to Cronberg in the Taunus Mountains. Together with L. Bokelmann he developed a new type of genre painting in the style of the Belgians, Leys and Gallait, representing courtroom scenes. His art may be divided into three distinct periods. To the first belong the "Peasant Delegation" and "Disturbed Rest" of a satirical nature; to the second, "The Hour of Decision" (Munich, Pinakothek), and other court scenes, and also his religious pictures, such as "Christus Victor" and "Christmas Morning." During the third period he turned to the painting of landscapes and historical subjects, like the extensive frescoes in the Römer at Frankfurt.

BRUTTII. The name of an ancient tribe and of a territory of Italy, comprising the southern extremity, or toe, of the peninsula, now called Calabria. The people known as Bruttians became rulers in this part of the peninsula about 356 B.C. Before that time the inhabitants seem to have been of some Pelasgian race, but at an early date Greek adventurers started settlements on the coast, of which the more important were Crotona, Rhegium, and Locri. The warlike Greeks subjected the natives and held them in slavery until after the Peloponnesian War. At that period the Lucanians came in from the north and still further oppressed the natives. At last, about the middle of the fourth century B.C., the people, rising against oppression, became their own masters; they gained power rapidly, captured some of the Greek cities, and, assisted by the Lucanians, held their own against the Grecian arms. The Bruttii were powerful until after their participation in the Samnite War against Rome, 282 B.C. They sent auxiliaries to Pyrrhus of Epirus (q.v.). Not long afterward they were subjected to Rome and gave up much of their territory. In the Second Punic War they revolted and assisted Hannibal, for which they were punished by Rome in the sacrifice of what little they had left of independence. At that time the Bruttii as a nation disappeared from history. In their best days their chief towns were Consentia (Cosenza) and Petelia (near Strongoli). The country contained a great forest, called Sila, which yielded great quantities of pitch. In the new reorganization of Italy under Augustus, *Bruttii* and *Lucania* were joined to form the Third Region. After the time of Diocletian this region was organized as a province under a *corrector*, or governor.

BRUTUS. 1. A tragedy of Voltaire (1730), which suggested the tragedies *Marcus Brutus* and *Junius Brutus* of Alfieri. 2. A tragedy of Catherine Bernard, produced by the Comédie Française in 1690.

BRUTUS, or **BRUTE**, THE TROJAN. The mythological first King of Britain, grandson of Ascanius, the son of Æneas. He unintentionally slew his father, Sylvius, and fled to Greece, thence to Britain, where he founded New Troy, or London. See **WACE**.

BRUTUS, LUCIUS JUNIUS. A Roman who figures in the legendary history of early Rome, as the hero who overturned the monarchical form of government and established the Republic. The legend runs that he was the son of a rich Roman. On his father's death Tarquin the Proud took possession of the property and put an elder brother to death, and Brutus himself escaped the same fate only by feigning idiocy (hence the name *Brutus*, stupid). Sent with the two sons of Tarquin to consult the oracle of Delphi about a prodigy, he asked the god who would be the next king. "He who first kisses his mother," was the reply. On their return to Italy the brothers hastened to Rome to kiss their mother; but Brutus, pretending to slip, fell and kissed his mother earth. Remembering his own wrongs and gifted with the strength and wisdom of one who was fulfilling the decrees of fate, Brutus, when the foul rape committed by one of the royal family upon Lucretia had shocked the people, convoked them, placed himself at their head, and drove the kings from Rome. He is said to have been then elected one of the two first consuls (509 B.C.).

That his character as a stern old Roman hero might be complete, the legend adds that he sacrificed to the new Republic his own sons, detected in a conspiracy to restore the monarchy; and that at last he fell in mortal combat repelling an attack led by Aruns, one of the sons of Tarquin; Brutus and Aruns fell each by the other's hand. Little more, however, can be said to be established upon sufficient historical evidence with regard to Brutus than that there existed a person of that name who held high office in Rome at a very early period. Consult Bondurant, *Decimus Junius Brutus Albinus* (Chicago, 1907).

BRUTUS, MARCUS JUNIUS (c.85-42 B.C.). One of the conspirators against Cæsar. His father bore the same name, was a follower of Marius, and, suffering defeat from Pompey, was at the latter's direction put to death. At this time the son was but eight years old, and his education was in part watched over by his uncle, Marcus Cato Uticensis (Servilia, mother of Brutus, was Cato's half-sister), whose philosophy he adopted. He studied and practiced law, as had his father before him, but civil life was interrupted by political conditions. On the outbreak of hostilities between Cæsar and Pompey he gave his support to the man who destroyed his father. Cæsar, however, victor at Pharsalus, pardoned him, took him into favor, and appointed him Governor of Cisalpine Gaul (46). Here his conduct was that of a high-minded official, and in 44 the office of *prætor urbanus* was conferred upon him by Cæsar. It was while holding this place that he became a conspirator against the promoter of his career. After the assassination of Cæsar, unable to win a following in Rome, he escaped to Athens and succeeded in raising a large force and becoming powerful in Macedonia. Cassius (q.v.) had been equally successful in equipping an army in Asia, and together they proceeded to Philippi, where they joined battle with Antony and Octavianus. As commander of the Republican right, Brutus repulsed Octavianus; but Cassius, overcome by Antony and feeling that their cause was lost, made an end of himself. This example Brutus soon followed. His wife Porcia, daughter of Cato Uticensis, is said by Plutarch and others to have committed suicide by swallowing red-hot coals. The glamor thrown over the character of Brutus by Shakespeare will, unhappily, not bear scrutiny. He was at one time a relentless usurer and did not scruple to apply to Cicero as Governor of Cilicia for power to make unlawful exactions. His political affiliations, too, appear suspicious, and his joining the conspirators seems to have been the result of the seductive power of the astute Cassius rather than of any deep-set convictions. Somewhere he was weak or corrupt; but it is charitable to believe that the principles of his Stoic philosophy grew upon him and that he became worthier of his grand old uncle, Cato. His studies present him in his most amiable light: for, notwithstanding his military successes, he was a student, not a man of action, a theorist, not a doer of deeds. His philosophical treatises, dealing with virtue, duties, and patience, have been lost, but we still have part of his correspondence with Cicero. Cicero dedicated to him his *Orator*, a description of the ideal orator, and called his history of Roman oratory *Brutus*.

BRÜX, brüks (Ger. *Brücke*, bridge; its Czech name *Most*, bridge, being a mere translation).

A town in the Austrian crownland of Bohemia, on the Biela, about 50 miles northwest of Prague. Its principal buildings are the new Rathaus, and the Gothic Dechantenkirche, built in 1517. Brůx is the centre of a productive brown-coal district, and manufactures sugar, cast iron, machinery, potash, and enameled ware, and has several breweries and distilleries. In the neighborhood are the bitter-water springs of Püllna, Sedlitz, and Seidschütz. Pop., 1890, 14,900; 1900, 21,500; 1910, 22,364. Brůx was made a city in 1273 by King Ottokar II.

BRUYAS, brü'yá', JACQUES (1637-1712). A French Jesuit missionary. Of the place of his birth or of his early career, little is known. He went to Canada in 1666 and was sent among the Iroquois Indians as a missionary. He studied the Mohawk language and wrote a work in Latin on the *Mohawk Radicals*, the most extensive work yet written on the subject. He was one of the first to work among those Indians and may be said to have established the mission there.

BRUYÈRE, brü'yär', JEAN DE LA. See LA BRUYÈRE.

BRUYN, broin, BARTHEL BARTHOLOMÆUS (1493-1556). A German painter of the Renaissance, who was born at Wesel but passed most of his life in Cologne, where he was admitted to the painters' guild in 1518. His early work shows the influence of Jan Joest and Joos van Cleef; later there is a change of style, probably due to Jan van Schorel and Heemskerck, who on their return from Italy taught him new principles of composition and anatomy learned from Michelangelo and Raphael, the Italian masters. Bruyn excelled as a portrait painter, and even in his religious pieces characteristic likenesses of his contemporaries are to be found. His most important religious pictures are the altarpiece at Essen, for the earlier period, and that of St. Victor's, Xanten, for the later. Other important examples are: "Adoration of the Magi" and "Martyrdom of St. Ursula," in the Cologne Museum; "St. Catherine" and "Lamentation over the Dead Christ," in the Munich Pinakothek. Among his best portraits are: "A Man and his Wife" (1532, Strassburg), "Young Patrician and his Wife" (1534, Berlin Museum), "An Old Man in Black Cap and his Wife" (Wiesbaden), "Burgomaster Brauweiler" (1535, Cologne), Johann von Aich and Margareta Rinck (Berlin). Other paintings by him are to be found in Vienna, Dresden, Berlin, Cologne, and Antwerp. —His son, BARTHOLOMÆUS THE YOUNGER (died before 1610), inherited his father's studio, but was inferior to him as a painter. He has been called the "Master with the Pale Faces," by reason of this characteristic in his paintings. He was member of the Council of Cologne, 1566-1606, and when his eyesight failed, became bannerman of the city in 1591. Consult E. Firmenich-Richartz, *Bartholomæus Bruyn und seine Schule* (Leipzig, 1891).

BRUYS, brü'ë, BRUIS, or BRUEYS, PIERRE DE (?-c.1126). A French religious reformer, founder of the Petrobrusians. He is mentioned in the *Epistola adversus Petrobrusianos Hæreticos*, written by Peter the Venerable (q.v.), Abbot of Cluny, to certain of the bishops of Provence and Dauphiné, not long after the death of De Bruys. His aim seems to have been to restore Christianity to its pristine simplicity. This meant, for him, to reject infant baptism, transubstantiation, prayers for the dead, and, in

general, costly churches. But his ill-directed eloquence effected little save violence on the part of his followers. He preached chiefly in the dioceses of Arles, Die, Embrun, Gap, Narbonne, and Toulouse, and was finally burned at Saint-Gilles. His followers united with the Henricians.

BRYAN. A village and the county seat of Williams Co., Ohio, 55 miles west by south of Toledo, on the Lake Shore and Michigan Southern and the Cincinnati Northern railroads (Map: Ohio, A 3). There are manufactories of condensed milk, show cases, wheelbarrows, agricultural implements, and picture frames. The water works and electric light plant are owned by the village. Pop., 1900, 3100; 1910, 3641.

BRYAN. A city and the county seat of Brazos Co., Tex., 100 miles southwest of Houston, on the Houston and Texas Central and the International and Great Northern railroads (Map: Texas, D 4). It is the seat of the Free-Will Baptist Academic and Collegiate Institute, a Baptist academy (coeducational), Allen Academy, and an Ursuline convent. It has also a Carnegie library. The Texas Agricultural and Mechanical College is 4 miles distant. A considerable trade is carried on in live stock, cotton, and cottonseed products. There are oil mills, a cotton compress, cotton gins, and a fertilizer mill. The city owns its water works and electric light plant. Pop., 1900, 3589; 1910, 4132.

BRYAN, CHARLES PAGE (1856-). An American diplomat, born in Chicago. He attended the University of Virginia for two years and studied law at Columbian (now George Washington) University. He was a member of the Colorado House of Representatives in 1880 and of the Illinois Lower House in 1888-97. Previous to receiving his first diplomatic appointment he had twice visited Europe in the interest of the Chicago World's Fair. From 1897 to 1911 he held, in succession, the posts of Minister to China, Brazil, Switzerland, Portugal, and Belgium. He was appointed Ambassador to Japan in 1911, but resigned the next year.

BRYAN, ELMER BURBETT (1865-). An American educator, born at Van Wert, Ohio. He was educated at Indiana, Harvard, and Clark universities. From 1882 to 1896 he was a teacher in the public schools of Indiana, and thereafter was in succession professor of social and educational science at Butler College, assistant professor and associate professor of pedagogy in Indiana University, principal of the Insular Normal School, Philippine Islands, and general superintendent of education in the islands. In 1903 he returned to Indiana University as professor of educational and social psychology. He became president of Franklin College in 1905 and of Colgate University in 1909. His publications include: *Nascent Stages and their Pedagogical Significance* (1900); *The Basis of Practical Teaching* (1905); *Fundamental Facts for the Teacher* (1911, 1912).

BRYAN, MICHAEL (1757-1821). An English art critic and connoisseur, born in Newcastle-on-Tyne. He was the author of a biographical and critical *Dictionary of Painters and Engravers* (2 vols., 1813-16). It was revised in 1889 by J. Stanley, in 1896 by R. E. Graves and Sir Walter Armstrong, and finally by George C. Williamson (5 vols., 1902-05). It is still recognized as the standard authority on the subject. In the last revision many of the articles have

been rewritten by the most prominent English authorities, but the shorter articles are often unreliable.

BRYAN, NATHAN PHILEMON (1872-). An American legislator, born in Orange (now Lake) Co., Fla. He graduated from Emory College (Georgia), studied law at Washington and Lee University, and for some time practiced in Jacksonville. In 1905-09 he was chairman of the Board of Control of the Florida State Institutions of Higher Education. He was elected United States Senator for the term 1911-17 and became chairman of the Senate Committee on Claims.

BRYAN, WILLIAM JENNINGS (1860-1925). An American orator and party leader, born in Salem, Ill., on March 19, 1860. He graduated at Illinois College in 1881, and then studied at the Union College of Law in Chicago (1881-83). From the latter year he practiced law in Jacksonville, Ill., until 1887, when he took up his residence in Lincoln, Neb. From 1891 to 1895 he served in Congress as a Democratic member of the Lower House. He soon attracted attention as an eloquent and effective debater, speaking particularly upon the subjects of the protective tariff, to which he was opposed, and the silver question. Mr. Bryan favored the free and unlimited coinage of silver at the ratio of 16 ounces of silver to 1 ounce of gold. Aug. 16, 1893, a very remarkable debate occurred, during the progress of which Mr. Bryan first attained a national reputation by an eloquent three-hour speech, which was an effective presentation of the bimetallic theory. The contest lasted in both houses of Congress until the Sherman Act had been defeated; for the moment Mr. Bryan had been defeated; yet he had established his reputation as an orator and as an adroit political leader. In 1893 and again in 1894 he was a prominent candidate for the United States senatorship from Nebraska. Not succeeding in this, he became editor of the *Omaha World-Herald* (1894-96) and delivered many speeches on "free silver" to enthusiastic audiences throughout the Mississippi valley.

In 1896 he was elected a member of the State delegation to the Democratic National Convention at Chicago which met on July 7-10, in a building which seated 15,000. Mr. Bryan's delegation was opposed by a delegation pledged to support the gold standard; but the silver men, headed by Mr. Bryan, were seated. It was an occasion of intense excitement, for the silver question had brought on a class and sectional struggle in which the gold faction (chiefly in the East) charged repudiation, while the supporters of free silver (mainly in the West and South) accused their opponents of greed and conspiracy. Many gold delegates were unseated; the representation from the Territories was increased threefold; a silver man, Senator S. M. White of California, was made the convention's permanent president; President Cleveland's policies were condemned; and a commendatory resolution offered by a minority was hooted down with catcalls and insulting cries. During the heated debate many well-known public men set forth their arguments and invectives—among them Benjamin R. Tillman (q.v.) of South Carolina, Senator David B. Hill of New York, Senator William M. Vilas of Wisconsin, and William E. Russell of Massachusetts; but no one spoke in such a way as to secure the attention and respect of the riotous assemblage, which had

now been increased to nearly 15,000 excited men and women.

It was then (July 9) that Mr. Bryan appeared upon the platform, faced the multitude and delivered the oration which made him famous, ending with the impassioned declaration, "You shall not press down upon the brow of labor this crown of thorns—you shall not crucify mankind upon a cross of gold!" The speech raised him from the divided leadership of a faction to the unchallenged mastery of a powerful political party. On the following day he was nominated (on the fifth ballot) by a majority of 90 delegates, over Richard P. Bland (q.v.) of Missouri, who had been his chief opponent, though representing the same financial views. Mr. Bryan was thus the choice of the convention to oppose William McKinley of Ohio, the Republican nominee. On July 22 he was also nominated by a convention (at St. Louis) of the National Silver Party, and on July 24 by a convention (at St. Louis) of the Populists. In the campaign which followed Mr. Bryan made a remarkable personal canvass of the entire country. In a single one of his tours he traveled 12,000 miles and was heard by immense audiences everywhere. But the conservative instincts of the country were gradually united against him. His campaign funds were limited; while the so-called Gold Democrats nominated (September 2) a conservative candidate, in the person of Gen. John M. Palmer of Illinois, at a convention in which 41 States and 3 Territories were represented. Mr. Bryan was defeated in November, when he received only 176 electoral votes to McKinley's 271. In the popular (i.e., Democratic and Populist) vote he had 6,467,946 ballots as against 7,035,638 ballots that were cast for Mr. McKinley; while General Palmer received 131,529 ballots. Many Democrats in the East preferred to vote directly for the Republican nominee.

In 1900 Mr. Bryan was nominated by acclamation in the Democratic National Convention, held at Kansas City (July 4), and was once more successfully opposed by Mr. McKinley, who received 292 electoral votes as against Mr. Bryan's 155, and a majority of about 850,000 ballots in the popular vote. He was defeated again in the Democratic Convention held at St. Louis in 1904, where the conservative element of the Democratic party once more resumed control and nominated Judge Alton B. Parker (q.v.) of New York. To him Mr. Bryan gave a half-hearted support, and many Bryan men openly spoke and voted against him.

In 1908 the National Democratic Convention at Denver (July 7) again gave the nomination to Mr. Bryan, but he was easily defeated by the Republican nominee, William H. Taft (q.v.), who received 321 electoral votes, as against 162 for Mr. Bryan, who in this election carried only 17 States with a popular vote of 6,409,106, while that of Mr. Taft was 7,679,006. Nevertheless, although this result practically ended Mr. Bryan's long attempt to secure the presidency, he not only retained, but actually strengthened, his hold upon his party organization, as he proved in a most convincing manner at the National Democratic Convention in Baltimore, Md. (June 25-July 2, 1912). Here, though he lost the chairmanship fight and failed to secure recognition for any of his own presidential candidates, he forced the nomination of the party's candidate before the platform had

been adopted and brought about the naming of Woodrow Wilson. Mr. Wilson made Bryan Secretary of State and he was confronted with many difficult situations, but his administration was not marked by skillful diplomacy or statesmanship. On June 9, 1915 owing to a difference of opinion with President Wilson he resigned. In the campaigns of 1916 and 1920 he was not conspicuous, and in the latter year did not support the Democratic nominee, Cox. In 1918 he became President of the National Dry Federation and advocated general Prohibition. He removed to Miami, Florida in 1920 and from that State was elected as a delegate to the Democratic Convention of 1924 at New York. Mr. Bryan was an outspoken defender of the old-fashioned expression of the Christian faith and the literal interpretation of the Bible as against modernism and evolution. His last public appearance was in July, 1925, at the trial at Dayton, Tenn. of John Thomas Scopes, a teacher of biology, on the charge of violating a State statute which forbade the teaching of evolution. On Sunday, July 26, 1925, after the termination of this trial, Mr. Bryan died while sleeping. He was buried in Arlington National Cemetery. July 31. His writings include, *The First Battle* (1897); *Under Other Flags* (1904); *The Old World and Its Ways* (1907); *Heart to Heart Appeals* (1917); *The Menace of Darwinism*, and *The Bible and Its Enemies* (1921); *In His Image* (1922).

BRYANSK. See BRIANSK.

BRYANT, HENRY GRIER (1859-). An American explorer and traveler. He was born in Allegheny, Pa.; graduated in 1883 at Princeton University and in 1886 at the law department of the University of Pennsylvania, and in 1892 was second in command in the Peary Relief Expedition to Greenland. In 1894 he commanded the Peary Relief Expedition of that year and in 1897 the expedition to Mount St. Elias, Alaska. He was president of the Geographical Society of Philadelphia in 1897-1900, 1904-06, and 1909-10.

BRYANT, JOSEPH DECATUR (1845-1914). An American surgeon, born in East Troy, Wis. He attended Norwich Academy in New York and graduated in 1868 at the Bellevue Hospital Medical College. With the faculty of the latter institution he soon became identified, being advanced until in 1883 he was made professor of anatomy and clinical surgery and associate professor of orthopedic surgery. He accepted (1898), in addition, a professorship in the principles and practice of surgery and became consulting surgeon to a large number of New York hospitals. He was a personal friend and physician of Grover Cleveland. His writings on surgical subjects include *Operative Surgery* (2 vols., 1905) and *Bryant and Buck's American Practice of Surgery* (8 vols., 1906-11).

BRYANT, WILLIAM CULLEN (1794-1878). A distinguished American poet and journalist. He was born in Cummington, Mass., Nov. 3, 1794, the son of Dr. Peter Bryant, a physician and a member, for several terms, of the Massachusetts Legislature. He showed his precocity as a poet by publishing verse, at the age of 13, in the *New Hampshire Gazette*, and by writing the following year a satirical poem, "The Embargo," in the eighteenth-century manner; his most famous poem, "Thanatopsis," was probably composed in 1811, though it was not published till 1817. Bryant studied for a year at Williams

College, then took up law. He was admitted to the bar in Plymouth, Mass., in 1815, practiced in Plainfield, Mass., for a year, and in Great Barrington for nine years. During this time he was so well known as a poet that he was invited to deliver the Phi Beta Kappa poem at Harvard College in 1821, and his poem on that occasion, "The Ages," was published with several others in the same year. In 1825 Bryant removed to New York, where he became editor of the *New York Review*. In the following year he became assistant editor of the *New York Evening Post* and in 1828 was made editor in chief of that paper—a post which he held till his death. During this time he wrote and published many poems and several works in prose, besides his regular newspaper articles. Aside from his poems, which were published occasionally in various newspapers and magazines, Bryant's chief published works are the following: *Letters of a Traveler* (1850); *Letters from Spain and Other Countries* (1859); *Letters from the East* (1869); *Orations and Addresses* (1873); and several volumes of collected poems. During the period of his active literary work he found time to translate the epics of Homer, his well-known version of the *Iliad* appearing in 1870, and that of the *Odyssey* in 1871-72. His death occurred in New York, June 12, 1878, as the result of a sunstroke, while he was making an address at the unveiling of a statue in Central Park.

The literary and journalistic career of Bryant comprises nearly two-thirds of a century. Noted, as a boy, for his precocity, and as a man, living for fifty years in the largest city in America, for the simplicity and wholesomeness of his life and for his distinction of mind and bearing, his career is one of the longest in the history of American letters. He is best known as a poet. His "Thanatopsis," "To a Waterfowl," "The Death of the Flowers," "The Fringed Gentian," "The Crowded Street," "My Country's Call," "The Battlefield," and several other poems are popular, and such lines as "Truth, crushed to earth, shall rise again" (from "The Battlefield"), and "The melancholy days are come, the saddest of the year" (from "The Death of the Flowers"), have become household quotations. The poems named were produced at widely different periods during his life, but they may be taken as representative of the quality of his work, which during his long life changed very little. Generally speaking, the poetry of Bryant is distinguished for its restrained and grave thoughtfulness. Though in finish of form, restraint, lack of fire, reflectiveness, and sentiment, it belongs to the type of the eighteenth century rather than to the period of passionate expression which in England was contemporaneous with it, Bryant's poetry, nevertheless, is not wanting in originality. Besides its frequent tenderness and sympathy with sadness, one notes in it a feeling of refined patriotism, a constant love of liberty, and a zeal for the institutions of freedom. So, too, one finds in his poetry admiration for whatever is noble and generous in the life of the North American Indian and other primitive peoples, though his feeling for the red man is probably based on a vaguer and even more remote tradition than that of his contemporary, Cooper. In all the poems, however, the constant note is moralizing, void of subtlety. Most of the poems of Bryant are short, and the verse forms are not very numerous; the one in

which he attained greatest skill is a simple blank verse, as in "Thanatopsis." This verse is employed in his translations of the *Iliad*.

As a journalist, Bryant is less known to-day than such an editor as Horace Greeley. For a full half century he was, as proprietor and editor of the *New York Evening Post*, one of the most insistent and uncompromisingly urgent of all the antislavery propagandists of the North. The prose style of his editorial articles was simple, straightforward, and vigorous, lacking in subtlety and ambiguity, and never failing to make its point, and is marked, in substance, by common sense and breadth of view. Like all ephemeral writing, Bryant's leading articles are unread; and the same remark, in general, applies to his more elaborate prose productions, especially his literary essays, of which that on Irving is the best.

It should be added that Bryant deserves some praise as a poetic delineator of American scenery. It is worth noting, also, that between 1828 and 1845, when the cares of journalism pressed heavily upon him, his poetic productivity suffered. After the latter date, almost to his death he showed a rather surprising affluence and power, publishing many of his best poems, such as "The Flood of Years." Readers should be cautioned against believing that "Thanatopsis" is entirely the product of a mere youth, since the famous passage about the quarry slave was apparently added several years after Bryant reached his majority.

The best edition of Bryant is that of his son-in-law, Parke Godwin, in 6 vols., *The Life and Works of William Cullen Bryant* (New York, 1883-84). There is a *Life* by John Bigelow, in the "American Men of Letters Series" (Boston, 1890). Good critical appreciations are those of E. C. Stedman, in *Poets of America* (Boston, 1885), of Prof. Barrett Wendell, in *A Literary History of America* (New York, 1900), in Stoddard's introduction to his *Poetical Works of Bryant* (New York, 1903, 1907); and W. A. Bradley, *W. C. Bryant* (New York, 1905).

BRYAXIS (Gk. *Βρύαξ*). A Greek sculptor, contemporary of Scopas, Timotheus, and Leochares, with whom he participated in the work on the Mausoleum at Halicarnassus about 350 B.C. He also created five colossal figures of the gods at Rhodes, statues of Bacchus at Cnidus, of Æsculapius and Hygeia at Megara, of Apollo in the grove of Daphne at Antioch, of Serapis at Alexandria, and a portrait of Seleucus. In 1891 a basis for a tripod, bearing his signature and three small reliefs, showing figures of horsemen, was found in Athens, and has suggested the possibility of identifying his work among the reliefs from the Mausoleum. His statue of Serapis seems to have given the type for all the later heads of this deity. Consult *Bull. corresp. hellénique*, vol. xvi (Paris, 1892).

BRYCE, GEORGE (1844-). A Canadian historian, born at Mount Pleasant, Ontario, Canada. He was educated at the University of Toronto and at Knox College, Toronto. Having been selected by the Presbyterian Church of Canada for the task, he organized Manitoba College in 1871, and Knox and St. Andrew's churches, Winnipeg, in 1871-72. He served as the first moderator of the Synod of Manitoba in 1885, and as moderator of the General Assembly in 1902-03. He was a founder, and from 1877 to 1907 a counselor and examiner, of the University of Manitoba. From 1891 to 1904 he was

head of the faculty of science and lecturer in biology and geology. His publications include: *Manitoba: Infancy, Progress, and Present Condition* (1882); *The Apostle of Red River* (1898); *Remarkable History of Hudson's Bay Company* (1900); *The Romantic Settlement of Lord Selkirk's Colonists* (1900); *The Canadianization of Western Canada* (1910); *Life of Lord Selkirk* (1912), and *A Short History of the Canadian People* (new ed. 1913).

BRYCE, JAMES (1838-1922). An eminent English writer and legislator. He was born in Belfast, Ireland, studied at Glasgow University, and in 1862 graduated at Trinity College, and won a fellowship in Oriel College, Oxford. In 1864 he published a monograph, *The Holy Roman Empire*, which quickly gave him a reputation as an historical writer of unusual insight and ability. Scholarly, brilliant, and original in treatment, a model of condensation and lucidity, this book has been widely read in England, in America, and on the continent of Europe, and has been translated into several European languages. In 1867 Mr. Bryce became a barrister at Lincoln's Inn and practiced until 1882. He was appointed regius professor of civil law at Oxford in 1870, but resigned in 1893. In 1880 he entered political life as a member of Parliament for the Tower Hamlets and attained immediate prominence as a Liberal and a follower of Gladstone. In 1885 he was chosen member for Aberdeen, South. He became Undersecretary of State for Foreign Affairs in Gladstone's government in 1886, Chancellor of the Duchy of Lancaster, with a seat in Gladstone's cabinet, in 1892, and President of the Board of Trade in 1894. In 1894 he also served as chairman of the Royal Commission on Secondary Education and was elected fellow of the Royal Society. He became Chief Secretary for Ireland in the Campbell-Bannerman ministry formed in December, 1905. In 1907 he became British Ambassador to the United States, which post he filled until 1913. In the latter year he was appointed by the British government a member of The Hague International Arbitration Court. After leaving Washington he made an extensive tour of the Orient. He received honorary degrees from a number of universities. On Jan. 1, 1914, he was created Viscount Bryce of Dechmont, already possessing, since 1907, the Order of Merit. As a politician he has consistently taken the Liberal side in all the great controversies that have arisen since his election to the House of Commons, and has been especially conspicuous as an advocate of home rule for Ireland, of the abolition of university tests, of international copyright, and of the thorough revision of the statute law. He is perhaps even better known as a writer, and especially as the author of *The American Commonwealth* (1888), the material for which was collected during three visits to the United States in 1870, 1881, and 1883. In this work he gives, with remarkable accuracy, sympathy, and insight, probably the best account ever written of the political institutions of the United States, considered in their relation to the history, the character, and the habits of the American people. He has published also two excellent books of travel: *Transcaucasia and Ararat* (4th ed., 1896) and *Impressions of South Africa* (1897); a volume of *Studies in History and Jurisprudence* (1901); *Studies in Contemporary Biography* (1903); *South America: Observations*

and Impressions (1912; Sp. trans., *La América del Sud*, by Guillermo Riviera, 1913).

BRYCE, LLOYD (1851-1917). An American diplomat and writer, born at Flushing, L. I., and educated at the Jesuit College in Georgetown, D. C., and at Christ Church, Oxford. He studied law at Columbia University, filled several political positions in New York State, and was a member of Congress in 1887-89; then, being left a controlling interest in the *North American Review* by Allen Thorndyke Rice, he purchased the remaining interests and conducted this periodical until 1896. In 1911 he was appointed Minister to the Netherlands and Luxemburg. His writings include: *Paradise: A Dream of Conquest* (1887); *The Romance of an Alter Ego* (1889); *Friends in Exile* (1900); *Lady Blanche's Salon* (1900); *The Literary Duet*; *After Christianity, What?*

BRYDGES, GEO., first BARON RODNEY. See RODNEY.

BRYDGES, brif'ez, SIR SAMUEL EGERTON (1762-1837). An English bibliographer and genealogist. He was educated at Cambridge and was admitted to the bar, but never practiced. He claimed, unsuccessfully, in 1789 the barony of Chandos of Sudeley. He edited Collins's *Peerage* (1812), and Tudor writers, privately printed at Lee Priory, Kent. He wrote *Censura Literaria* (5 vols., 1805-09); *The British Bibliographer* (1810-15) with J. Haslewood; *Restituta* (1814-16); and an *Autobiography* (1834).

BRYENNIOΣ, Gk. pron. brē-én'nē-ōs, PHILOTHEOS (1833-). A Greek theologian. He was born in Constantinople, was educated in the Patriarchal Seminary at Chalkis, and attended courses at the universities of Berlin, Leipzig, and Munich, where he became familiar with German theology. He consorted with Western theologians more frequently than is customary among Greek ecclesiastics and attended the Bonn Conference of Old Catholics in 1875. He was professor of church history at Chalkis, Metropolitan of Serez, and afterward Metropolitan of Nicomedia. He was the discoverer of the first complete manuscript of the two *Epistles of Clement*, published in 1875, and of the only known manuscript of *The Teaching of the Twelve Apostles*. The publication of the latter, in 1883, along with notes and prolegomena, all in Greek, was one of the most notable theological events of the day and led to the production of an extensive literature. Both manuscripts were found in 1873 in the Monastery of the Holy Sepulchre, Constantinople, in one cover along with four others. See **TEACHING OF THE TWELVE APOSTLES**.

BRYMNER, DOUGLAS (1823-1902). A Canadian journalist and archivist. He was born in Greenock, Scotland; was educated in a grammar school there and in 1857 removed to Canada, where for a time he devoted himself to farming. He afterward became a journalist and for some time was editor of the *Presbyterian* (the official organ of the Presbyterian church in Canada) and associate editor of the *Montreal Daily Herald*. In 1872 he was appointed Archivist of the Dominion of Canada, and in this capacity he rendered important services to students of American and Canadian history by issuing a series of volumes containing abstracts of the valuable manuscripts stored in the Canadian archives.

BRYMNER, WILLIAM (1855-). A Canadian painter. He was born in Scotland, but

came to Canada at an early age and was educated in the Province of Quebec. He studied painting in Paris under Bougereau, Tony, and Fleury, and afterward exhibited in the Paris Salon and the Royal Academy, London. In 1886 he was elected a member of the Royal Canadian Academy, vice president in 1907, and president in 1909. He was awarded medals at the Pan-American Exposition, 1901; the St. Louis Exposition, 1904, and the Louisiana Purchase Exposition, 1905. He excels both in landscape and the painting of the human figure.

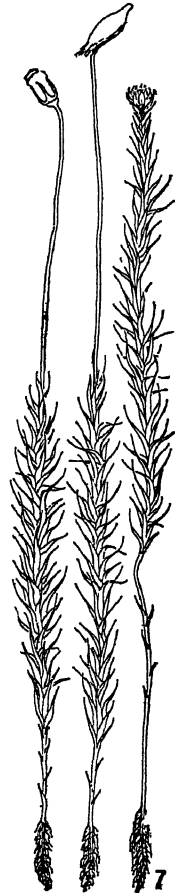
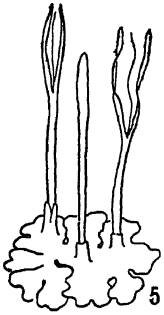
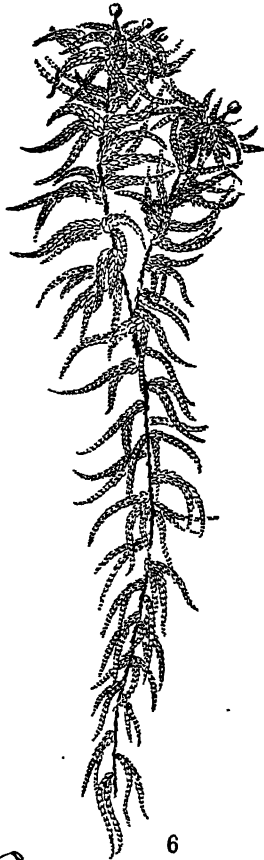
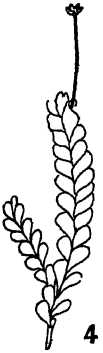
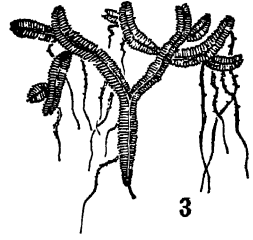
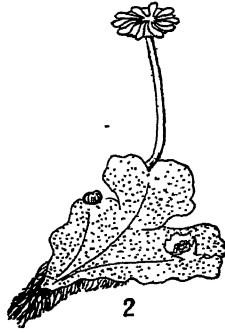
BRYN MAWR (mär) COLLEGE. An institution for the higher education of women at Bryn Mawr, Pa., about 10 miles northwest of the centre of Philadelphia. The college was founded by Joseph W. Taylor, was incorporated in 1880, and opened for students in 1885.

Bryn Mawr is distinctive among women's colleges in that its course and method of study are based upon the university model. The system of "major and minor electives in fixed combination" has been adopted; students are grouped in accordance with the work they have actually accomplished, instead of by arbitrary "classes"; original research is in all cases encouraged; and, in pursuance of the same policy of placing the scholarship of the college upon a basis of pure merit, candidates for admission as undergraduates are not accepted upon certificate, and honorary degrees are not granted. The college offers the graduate degrees of A.B., A.M., and Ph.D. Fifteen resident fellowships, 24 graduate scholarships, and 4 European fellowships are offered to graduate students, 10 graduate scholarships are offered to English, German, and French women, and there are also 50 scholarships and a students' loan fund for undergraduates.

Bryn Mawr has grown rapidly since its foundation, and in 1913 had 66 professors and instructors and a student body of 467. The library, largely designed for specialized study, contained in the same year over 68,000 bound volumes and 10,000 pamphlets, including the classical library of Professor Saupe of Göttingen. The college buildings include six halls of residence, accommodating from 60 to 70 students each—Taylor Hall containing the lecture rooms and office of administration, a large library building, with a book capacity of 187,000 volumes, 14 seminar rooms, lecture rooms, laboratories, a model school, etc., a well-equipped gymnasium, Dalton Hall, a lighting and heating plant, an infirmary, two apartment hotels for men and women professors, and nine houses for professors. The endowment fund is \$1,890,000, the value of the buildings and grounds \$1,950,000, and the annual income about \$302,700. President. Miss M. Carey Thomas. Consult the president's *Annual Report* (Philadelphia, 1887 et seq.).

BRYONY (Lat. *bryonia*, Gk. βρυονία, *bryōnia*, from βρύειν, *bryein*, to teem, swell). A genus of plants of the family Cucurbitaceæ. The common bryony (*Bryonia dioica*), the only British species, is frequent in hedgerows in England, but is not indigenous to Scotland. It has cordate-palmate leaves, axillary bunches of flowers, and red berries about the size of a pea. It abounds in a fetid and acrid juice. The root is perennial, very large, white, and branched, has a repulsive smell, and is acrid, purgative, and emetic. *Bryonia alba*, common in the middle parts of Europe, possesses similar properties.

BRYOPHYTES



LIVERWORTS:

1. MARCHANTIA (Male).
2. MARCHANTIA (Female).
5. ANTHOCEROS.

3. BAZZANIA.
4. NOTEROCLADA.

MOSSES:

6. SPHAGNUM.
7. POLYTRICHUM.
8. HYPNUM.

The root of both is applied locally to bruises and was formerly very much in use as a purgative. It contains a bitter glucoside, called *bryonin*, to which it seems to owe its properties. The young shoots of both species are, however, so free from acrid and dangerous qualities that they may be used as potherbs. The roots of the other species of the genus are also acrid and purgative. The roots of *Coccinia abyssinica*, formerly regarded as a species of *Bryonia*, are eaten. Black bryony (*Tamus communis*) is a plant of a different family, Dioscoreaceæ.

BRYOPHYLLUM (Gk. βρύον, *bryon*, a mossy seaweed, blossom + φύλλον, *phyllon*, leaf). A genus of plants of the family Crassulaceæ. *Bryophyllum calycinum*, a succulent shrubby plant, a native of the Moluccas, with quinate or almost pinnate leaves, oblong deeply crenulated leaflets, and panicles of large pendulous greenish-yellow flowers, is not unfrequent in hothouses, being regarded as an object of interest, on account of its producing buds on the edges of the leaves. If a leaf be placed upon moist sand or earth, in a short time new plants will appear from its indentations. This curious mode of propagation is found also in the bog orchis (*Malaxis paludosa*), a plant of a very different family.

BRYOPHYTES (Gk. βρύον, *bryon*, a mossy seaweed, blossom + φυτόν, *phyton*, plant). One of the four primary groups of the plant kingdom, containing the two great divisions popularly known as Mosses (*Musci*) and Liverworts (*Hepaticæ*). The liverworts are considered to have been derived in some way from the green Algae and to have given rise in turn to the mosses. It is the liverworts, therefore, which represent the transition between the aquatic life of Algae and the terrestrial life of most Bryophytes. As a consequence of this transition from the aquatic to the terrestrial habit, great changes in structure were produced, so that the Bryophytes are very different from the Algae.

One of the most important facts connected with Bryophytes is the distinct alternation of generations (q.v.) which they exhibit. The group is also distinguished by the many-celled sex organs. The antheridium (male organ) is a body of various shapes, from ovoid to club-shaped, and consists of a single layer of sterile cells, which serves as a wall; within this there is a compact mass of very small and numerous mother cells, each one of which organizes usually two biciliated sperms. The sperm of Bryophytes is one of their distinguishing characters, the body being small, little if at all curved, and always bearing two cilia. The archegonia are flask-shaped organs, consisting of neck and venter, the latter containing the single large egg. See **ANTHERIDIUM** and **ARCHEGONIUM**.

The fertilized egg lies within the venter of the archegonium, and when it begins to germinate the venter also begins to increase in size and in character. In the true mosses the young sporogonium grows faster than the venter, and finally breaks it, carrying the whole top of the modified archegonium upon its apex like a cap. This loose cap may be found upon the capsules even when they are ready to shed spores and is known as the calyptra. The gradual evolution of the sporophyte, from its simplest form in the liverworts, to its most complex form in the true mosses, is of great morphological interest. The simplest sporophyte in Bryophytes is that of the liverwort known as *Riccia*, in which it con-

sists of nothing more than a capsule with a single layer of sterile cells for a wall, all of the cells within being devoted to the production of spores. As one passes from *Riccia* to the higher forms, there is a gradual diminution of the tissue devoted to the production of spores, and therefore a gradual increase of the sterile tissue. Finally, in the true mosses the sterile tissue far exceeds in mass the sporogenous, the former consisting of foot, seta, and the bulk of the capsule; while the latter is restricted to a single layer or two of cells within the capsule.

The opening (dehiscence) of the capsule is also a matter of interest among the Bryophytes. In the lower liverworts the wall merely decays or bursts, liberating the spores. Among the leafy liverworts it splits into four distinct valves, which spread apart. Among the liverworts of the genus *Anthoceros* the capsule is elongated like a very slender pod and splits into two valves like a pea pod. Among the mosses, however, a distinct lid (operculum) is developed, which is pushed aside when the capsule is ready to discharge its spores. In the true mosses a further elaboration of the capsule usually occurs in the formation of what is called the "peristome," a set of toothlike processes often of beautiful pattern, which spring from the rim of the capsule and stretch toward the centre. These are hygroscopic, and by their curving in and straightening out help to loosen up the spores. Among the liverworts there is also a device for assisting in spreading and somewhat scattering the spores. Certain mother cells do not produce spores, but become modified into long fibre-like cells, which are spirally thickened. These cells are known as "elaters," and by their jerking, jumping movements when alternately moistened and dried they help to scatter the spores with which they are in contact.

The sex organs of Bryophytes are borne in a variety of ways. Among the liverworts they are sometimes scattered over the back of the thallus body; in others they are collected in definite groups upon the body; in still others, as in *Marchantia*, they are carried upon a special branch, at whose summit there is a disk in which they are developed. In the mosses the antheridia and the archegonia occur in clusters at the ends of main axes or branches. In some cases the antheridial and archegonial clusters are separated; in others, the two organs are found in the same cluster. The leaves at the tips which bear the sex organs become more or less modified, forming a rosette, and, usually being larger than the ordinary leaves and sometimes differently colored, they have been called "flowers." Among the sex organs, and especially among the antheridia, there often occur hairlike outgrowths, known as "paraphyses" (q.v.). For a further account of the two great groups of Bryophytes, see **HEPATICÆ** and **MUSCI**.

In addition to the books cited under **MORPHOLOGY**, all of which treat more or less fully of this group, consult Campbell, *Mosses and Ferns* (New York, 1895), which gives a more detailed account of the structure and development of Bryophytes. For works on classification, see authorities referred to under **TAXONOMY**.

BRYOZOA (Gk. βρύον, *bryon*, a mossy seaweed + ζῷον, *zōon*, animal). A class of aquatic animals allied to the brachiopods and worms, and called "Bryozoa" by Ehrenberg, in 1832, on account of the mosslike habit of many members

of the group. In the early days these animals were usually confounded with the Hydroids, to some of which they are quite similar, and already in 1830 they had received at the hands of J. V. Thompson, a British zoölogist, the name "Polyzoa," in reference to the colonial habit of the organism. This latter name has been used to great extent by the British zoölogists, often to the entire exclusion of the term "Bryozoa," while American and French authors have preferred the name given to the group of Ehrenberg. In accordance with the classification adopted by Parker and Haswell, and followed in its main features in this *ENCYCLOPEDIA*, the animals of this group are described under POLYZOA.

BRYSON. See ANTIPHON and BRYSON.

BRZEZANY, b'zhā-zhā'nī (from OCh. Slav. *brēza*, Pol. *brzoza*, AS. *birce*, Eng. *birch*). A town in the Austrian Crownland of Galicia, on the Złota-Lipa, near the Dniester, 50 miles southeast of Lemberg (Map: Austria, J 2). It manufactures leather, distills alcohol, and has a trade in wheat and agricultural products. Pop., 1890, 11,221; 1900, 11,244; 1910, 11,913.

BUACHE, bu'āsh'. See GARDEN ISLAND.

BUACHE, bu'āsh', PHILIPPE (1700-73). A French scholar and geographer, born in Paris. In 1729 he was appointed royal geographer and in 1730 a member of the Academy of Sciences. He was distinguished for his system of physical geography, according to which he divided the earth's surface into river valleys and watersheds, and arranged the ocean by means of submarine mountain chains, whose presence he held to be indicated by shoals and islands. His most important works are *Considérations géographiques et physiques sur les nouvelles découvertes au nord de la grande mer* (1753); *Atlas physique* (1754); *Parallèle des fleuves de toutes les parties du monde*.

BUADE, LOUIS DE. See FRONTENAC, COMTE DE.

BUANSU, bū'an-sōō'. The Anglicized native name, in the Himalayan region, of the Indian wild dog (*Cyon deccanensis*, or *dukkensis*), known by other names elsewhere in India. See *DOLE*; *DOG*.

BU'BALIS, or **BU'BALE** (Neo-Lat., Gk. *βούβαλις*, *boubalis*, an African species of antelope). An antelope (*Alcelaphus bubalinus*, or *bubalis*), one of the North African hartebeests, supposed to be the *bubalus* of the ancients. It is about the size of a large stag, with a long, oxlike head and muzzle, and heavily ringed lyrate horns. The color is bay, with a black tuft on the end of the tail. It is now nearly extinct in the eastern Sahara. See *HARTEBEEST* and *PLATE OF ANTELOPES*.

BUBASTIS, or **BUBASTUS** (Gk. *Βούβαρις*, *Boubastis*, *Βούβαρος*, *Boubastos*). The Greek name of the Egyptian city Pe(r)-Ubastet ('House of Ubastet'), mentioned in the Bible (Ezek. xxx. 17) as *Pi-beseth*. It was a place of considerable importance, devoted, as its name implies, to the worship of the goddess Ubastet (q.v.), and was the home or birthplace of the Pharaohs of the twenty-second and twenty-third dynasties. The site of Bubastis is marked by the ruins of Tell-Basta, near Zagazig, on the line of railway between Cairo and Suez. These ruins offer little to attract the attention of tourists, but excavations conducted on the spot by Naville, in 1887-88, brought to light many remains of fine temples and sculptures. The results of these excavations have been published by the Egypt Exploration Society in Memoir VIII, *Bubastis*

(1891), and in Memoir X, *The Festival Hall of Osorkon II* (1892). In the neighborhood is an extensive cemetery, in which cats—the animal sacred to the local goddess—were buried in such numbers that their bones have recently been employed in the manufacture of fertilizer. Consult Naville, *Bubastis* (London, 1891).

BUBASTIS (Egyptian *Ubastet*). A goddess of the Egyptians, worshiped at the city of the same name. Her sacred animal was the cat, and she is represented on the monuments either as a lioness-headed goddess, which was her more usual and hieratic form, or as a cat, or as a woman with a cat's head. The Greeks identified her with Artemis, though the ground of this identification is not clear. Bubastis was a solar rather than a lunar divinity, and, unlike Artemis, she was a goddess of joy and mirth. Her great annual festival at Bubastis was usually attended with excessive revelry. See *UBASTET*.

BUBBLE. An English term, defined by Blackstone as an unwarrantable undertaking by unlawful subscriptions, subjecting the parties who originate and put them in operation to the penalties of *præmunire* (q.v.). The South Sea Scheme and the Mississippi Scheme (q.v.) are examples. The Bubble Act (6 Geo. I, chap. 18) was "enacted the year after the infamous South Sea project had beggared half the nation," to punish the fraud. It was repealed, however (6 Geo. IV, c. 91), and such companies are now dealt with by the common law. Consult *The Bubbles of Finance* (London, 1865).

BUBBLE. The "city gallant" in Cooke's play which was originally known by the latter title, but which came finally to be called *Greene's Tu Quoque*. The part of Bubble was originally played by the famous comedian Greene. The rôle is that of a servant who becomes rich and affects the niceties of speech. A pet phrase of his is "tu quoque," which is constantly on his lips. Greene's lisping of the words became so famous that the play came first popularly, and then authoritatively, to possess its present title.

BUBBLE SHELL. A mollusk of the large and widely distributed marine gastropod family Bulliidae, whose shells are egg-shaped (often as large as a hen's egg) and so thin as to suggest a likeness to bubbles. They are protected by wide, upturned flaps of the mantle, also used, it is said, in swimming. They frequent muddy and sandy bottoms, hiding under seaweed or burying themselves in the mud. All are animal feeders and have large mouths, and the gizzard very muscular; and among its thick coats, in many species, are found calcareous bony plates, which, being moved against each other by its muscles, serve to grind down the food. A species of the eastern American coast is *Bulla solitaria*, having a brown-spotted shell.

BUBI, bū'bē. A Bantu tribe of Fernando Po, in the Gulf of Guinea. The tribal name means 'men,' and they call their island the universe. They number about 30,000 and are commonly held to be feeble and treacherous.

BU'BO (ML. from Gk. *βουβών*, *boubōn*, groin). A tumor consisting of a swollen lymphatic gland in the groin, the inflamed condition being secondary to an infection elsewhere, such as gonorrhœa (q.v.), chancre, or syphilis (q.v.). Bubo is also a prominent symptom of bubonic plague. See *PLAGUE*.

BUBONIC PLAGUE. See *PLAGUE*.

BUCARAMANGA, bū-kā'rā-mān'gā. The capital of the Department of Santander, Colom-

bia, situated on the Lebrija River, 185 miles northeast of Bogotá, over 3000 feet above sea level (Map: Colombia, C 2). It is the seat of a United States consular agent and is the chief market for the western part of Santander, a district producing tobacco, coffee, cotton, cacao, etc. There are valuable deposits of gold, silver, copper, and iron. Pop., about 20,000.

BUCCANEER (Fr. *boucanier*, from *boucan*, smokehouse, or place for curing meat; see below). A title applied to the adventurers who were known to the French as *Flibustiers*, to the Spanish as "demons of the sea," and among themselves as "brethren of the coast." These pirates infested the Caribbean Sea and harried the Spanish Main and the coasts of North America in the sixteenth and seventeenth centuries. The ruthless religious wars of the sixteenth century in Europe produced a body of daring fighters and seamen, like Drake, Hawkins, and Davis, who obtained large wealth in privateering operations against Spain, which were little better than legalized piracy according to the standards of a more humane age, although justified by the ideas and methods of their own time. Naturally enough, when in 1680-85 the English government undertook the suppression of freebooting and the semi-legal way was closed, open piracy was resorted to by the wild and reckless spirits whom the region and the age produced in such numbers. "Buccaneers" is the name especially applied to the pirates of the seventeenth century; those of the eighteenth were known as "marooners." The buccaneers at first had their headquarters on the little island of Tortuga del Mar, off the northwest coast of San Domingo, in the Bahama Channel, which was the main line of Caribbean commerce. They raided San Domingo and, taking the cattle from the Spanish plantations, dried the meat in buildings known in French as *boucan*, and sold it to passing vessels which put in for provisions. Later they made these very ships a prey and took to the sea themselves. From the Elizabethan seamen, who made war according to the ways of their age upon Spain, through the earlier buccaneers like Sir Henry Morgan, who confined his attacks to Spanish towns and vessels, and was given a kind of left-handed recognition by Spain's enemies, and Captain Kyd, who represents the transition to the out-and-out pirate, the line of development continues straight to the notorious marooners like Blackbeard, Roberts, and Avery. The name "marooners" came from the practice of the later pirates of marooning, or putting their victims whom they did not otherwise dispose of ashore on desert islands or other inhospitable coasts.

The story of the buccaneers, as it has been told, is much encumbered with fable. Its principal sources are the narrative of the Dutchman Esquemeling, who served with Morgan and seems to have told a fairly correct story. This narrative was translated from the Dutch into French and English. Capt. Charles Johnson edited, in the early part of the eighteenth century, numerous chapbook histories of pirates and highwaymen. His first edition was entitled *General History of the Pyrates of New Providence* (1724-27), and the second, *The History of Highwaymen and Pirates* (1734-42). Consult, also: *History of the Buccaneers of America* (London, 1816; reprinted 1891); Archenholz, *The History of the Pirates, Freebooters, or Buccaneers of America*, trans. from the German

(London, 1807); Pyle, editor, *The Buccaneers and Marooners of America* (London, 1891), which contains the narrative of Esquemeling; Stockton, *Buccaneers and Pirates of our Coasts* (New York, 1898); Haring, *The Buccaneers in the West Indies in the Seventeenth Century* (London, 1910); Johnston, *Famous Privateersmen and Adventurers of the Sea* (Boston, 1911); Téramond, *Pages d'histoire; la guerre sur mer, corsaires, pirates, boucaniers, filibustiers, négriers, etc.* (Vincennes, 1912).

BUCCARI, bu-kä'rë, or **BAKAR**, bâ-kär'. A free port of Croatia-Slavonia, in the county Modrus-Fiume, Austria-Hungary, on the Gulf of Quarnero, 5 miles east-southeast of Fiume. It is situated on the slope of a hill crowned by a fine castle and has a small but good harbor. An active coasting trade is carried on in fish, wine, wood, and coal. Shipbuilding and fishing are the industries, the tunny fishing being especially important. Pop., 1901, 1870; 1910, 2092.

BUCELLATI, boot'chè-lä'tè, ANTONIO (1831-90). An Italian jurist and penologist, born in Milan. He was appointed professor of law at the University of Pavia, where he lectured chiefly on canonical and criminal law and was also a member of several commissions that directed the preparation of the Italian penal code. He wrote some monographs on Dante, but is better known for his works on law and penology, as, *Sommi principii del diritto penale* (1865); *Pena militare* (1871); *Le système cellulaire* (1876); and *Il nihilismo e la ragione del diritto penale* (1882).

BUCCINATOR (Lat. *buccinator*, trumpeter, from *buccina*, trumpet). A muscle situated in the substance of the cheeks. It is so called because, when the cheeks are distended with air, as in blowing, the contraction of the buccinator muscles forces it out. Its principal action is to keep the food between the teeth during mastication.

BUCCINIDÆ (Neo-Lat., from Lat. *buccinum*, a shellfish used in dyeing purple, from *buccina*, trumpet). A family of gastropod mollusks, with medium or small-sized, heavy, ribbed, spiral shells, having a notch through which the long siphon is extended, instead of a long siphonal canal, as in the Muricidæ and other related forms. It has many genera and species, widely distributed, and includes some of the most familiar shells of the north Atlantic, as the whelks (*Buccinum*), conchs or winkles (*Fulgur* and *Sycotypus*), ivory shells (*Eburna*), periwinkles, drills (*Nassa*, etc.), purple shells (*Purpura*), etc., besides many stranger tropical forms. See **WHELK**.

BUCCLEUCH, bük-klŭ'. One of the oldest and most distinguished ducal families in Scotland. It traces its descent from Sir RICHARD LE SCOTT (1249-85). The ancestor who first became historically conspicuous was Sir WALTER SCOTT of Braxholm and Buccleuch (?1490-1552), a brave and powerful border chieftain who flourished in the reign of James V. On some incidents in his life his great namesake founded the *Lay of the Last Minstrel*. Buccleuch, from this early period associated with the family title, is a lonely estate in the vale of Rankleburn, Selkirkshire. Sir Walter fought bravely in the battle of Pinkie, 1547, and was slain in an encounter with Sir Walter Kerr, of Cessford, in the streets of Edinburgh, 1552. He was succeeded by his grandson, Sir WALTER SCOTT of Buccleuch (died 1574), a "knight wise, true,

and modest," who was succeeded by his only son (1565-1611), who bore the same name. This Sir Walter is celebrated for his military exploits on the border, not the least daring being the rescue of one of his attendants, Kinmont Willie, from the castle of Carlisle. For his service to the state, including organizing the border marauders for service in foreign wars, he was raised to the peerage, 1606, as Lord Scott of Buccleuch. Subsequent titles borne by the family are Barons of Eskdale, Earls of Buccleuch, 1619; Earls of Dalkeith, 1642; Earls of Doncaster and Barons Tynedale, England, 1662; Lords Scott of Whitecheter, Dukes of Buccleuch, 1663; Viscounts of Nith, Thorthorwald, and Ross, Barons Douglas, Dukes of Queensberry, Marquesses of Dumfriesshire, Earls of Drumlanrig and Sanquhar, 1684. The ducal title was conferred on the natural son of Charles II, JAMES SCOTT, Duke of Monmouth (q.v.), of rebellion fame (1649-85). Previously known as Fitzroy and Crofts, he was raised to the dukedom and assumed the family name of his wife, Countess Anne, daughter and heiress of the second Earl of Buccleuch, when he married her in 1663. In 1685 the Duke was beheaded. He left four sons and two daughters, and his duchess retained her honors, titles, and estates in her own right. She afterward married Lord Cornwallis, by whom she had a son and two daughters; she died in 1732. JAMES, her eldest surviving son, predeceased his mother and his son FRANCIS, by the death of his grandmother, succeeded to the title of Duke of Buccleuch. HENRY, third Duke of Buccleuch (born 1746), was the greatest and most estimable of his family. He had for tutor and friend Dr. Adam Smith, and his talents were directed toward the improvement of the soil, the planting of trees, the making of roads, the improving of the breed of sheep, and the social elevation of the numerous tenantry on his extensive estates in the south of Scotland. He died in 1812 and was succeeded by his son, CHARLES, fourth Duke, who, dying in 1819, was succeeded by his son, WALTER FRANCIS, born 1806. He is noted for the creation of the deep-water harbor and port of Granton, 2 miles from Edinburgh, the greatest public improvements ever executed in Scotland by an individual at his own private cost. He was Lord Lieutenant of Midlothian and Roxburghshire, and captain of the Queen's bodyguard in Scotland. He died in 1884 and was succeeded in the title by his son, WILLIAM HENRY WALTER (1831-1914). Consult Scott, *Manuscript of William Henry Walter Douglas Scott, Sixth Duke of Buccleuch and Queensberry* (London, 1897).

BUCENTAUR (Gk. *βοῦς*, *bous*, ox + *κένταυρος*, *kentauros*, centaur). The name of the vessel from which the doges of Venice, on Ascension Day, celebrated the marriage of the city with the Adriatic. This fête, called "La Sensa" by the Venetians, was instituted at the close of the tenth century to commemorate the subjugation of Dalmatia. At the close of the twelfth century the ceremonies for the wedding of the Adriatic received a definite form. A splendid water procession was formed, with the Doge in the *Bucentaur* and the nobles of Venice in gondolas and feluccas. When the vessels arrived at the mouth of one of the channels opening into the Adriatic, the Doge dropped a ring into the water, using the words, "We wed thee with this ring in token of our true and perpetual supremacy." The last ship was built in 1722-

29 and was destroyed by the French in 1797 or 1798. Consult Wiel, *Venice* (New York, 1894).

BUCEPHALUS (Gk. *Βουκέφαλος*, *Boukephalos*, literally, ox-headed, from *βοῦς*, *bous*, ox + *κεφαλή*, *kephalē*, head). The name of the favorite charger of Alexander the Great. It was probably also the name of a peculiar breed of horses in Thessaly. According to tradition, Alexander in his boyhood was the first to break in the steed Bucephalus and thus fulfilled the condition stated by an oracle as necessary for gaining the crown of Macedon. The town Bucephalia, on the river Hydaspes, in India, was founded near the grave of Bucephalus, which died during Alexander's Indian expedition.

BUCER, or **BU'TZER**, MARTIN (1491-1551). A Church reformer of the German Reformation. He was born Nov. 11, 1491, at Schlettstadt in Alsace. His real name was Kuhlhorn (Ger., cow horn), but, in accordance with the fashion of his time among scholars, he changed it into its Greek equivalent, *Bucer* being derived from *βοῦς*, *bous*, ox, cow + *κέρας*, *keras*, horn, and this combination was Latinized *Bucerus*. In 1506 he entered the Order of Dominicans. At the suggestion of his superior he went, in 1517, to Heidelberg to study theology, devoting his attention, however, at the same time to the Greek and Hebrew languages. An acquaintance with the works of Erasmus had already inclined Bucer towards Protestantism, and his views were confirmed by the influence of Luther at the Heidelberg disputations in 1518, at which Bucer was present. In November, 1520, Bucer left his cell and was for a couple of years chaplain to the Elector of the Palatinate. In 1521 he was released altogether from his monastic vows, and in 1522 he retired in disgust from the court. Following the example given by Luther at the Diet of Worms (1521), Bucer became one of the boldest and most decided of the German reformers. In 1523 he went to Strassburg, where he introduced the doctrines of the Reformation. It was his great desire to avoid theological divisions, and so he advocated compromises and the use of dubious formulas. Thus in the disputes between Luther and Zwingli he adopted a middle course and endeavored to make reconciliation between them; but this view of the sacraments, which approached that of Zwingli, exposed him to Luther's harsh reprobation, while at the Diet of Augsburg (1530), where he conducted himself with great circumspection and moderation, he generally accorded with the Lutheran views, but, along with other theologians, declined to subscribe to the proposed confession of faith, and afterward drew up the *Confessio Tetrapolitana*, i.e., the confession of the four cities, Strassburg, Constance, Memmingen, and Lindau. An agreement, however, was subsequently entered into between Bucer and the Lutherans, and as a disciple of Luther he appeared at the religious conference of the reformers held in Leipzig. He also tried to unite Protestants and Roman Catholics, as in the Diet of Ratisbon, 1541. He defended the bigamy of Philip of Hesse. In consequence of his refusal to sign the *Interim*—a temporary creed drawn up by order of the Emperor Charles V—Bucer was compelled to leave Strassburg and therefore accepted the invitation of Archbishop Cranmer (1549) and went to England to teach theology at Cambridge and assist Paul Fagius and others in forwarding the Reformation. His modesty, blameless life, and great learning won him many

friends in England: but his labors were soon interrupted by death, Feb. 28, 1551. His remains were interred in St. Mary's Church at Cambridge with great solemnity; but during the reign of Mary his bones, with those of Fagius, were taken from their graves and burned in the market place. His constant attempts to express himself in language agreeable both to Luther and Zwingli induced in him at times an obscure, ambiguous, and elusive kind of thought, to which, perhaps, Bossuet refers when he stigmatizes Bucer as "the great architect of subtleties." The religious passions of the time prevented his contemporaries from forming a fair estimate of his character. By some Protestant writers he is ranked as a theologian above even Luther and Melancthon. His best work is a translation and exposition of the Psalms, which he published under the pseudonym Aretinus Felinus (Strassburg, 1529). Conrad Hubert intended to edit the whole of Bucer's writings in 10 vols., but only one volume appeared (Basel, 1577), *Tomus Anglicanus*, or those writings which he produced in England. No collected edition has since appeared. A. Lang published *Der Evangelien-kommentar Martin Butzers und die Grundzüge seiner Theologie* (Leipzig, 1900). For bibliography, consult F. Mentz and A. Erichson, *Zur 400-jährigen Geburtsfeier Martin Butzers* (Strassburg, 1891); for biography, J. W. Baum, *Capito und Butzer* (Elberfeld, 1860), and Erichson, *Martin Butzer* (Strassburg, 1891); for Bucer's relations with Servetus, consult H. Tölin, *Servet und Butzer* (Berlin, 1880).

BUCH, böög, CHRISTIAN LEOPOLD VON (1774-1853). A celebrated German geologist, regarded by Humboldt as the greatest geologist of his age. He was born at Stolpe and received instruction under Werner at the Mining Academy of Freiberg. He afterward traveled for purposes of geological study through Germany, Scandinavia, Great Britain, France, Italy, and the Canary Islands. As a result of his investigations, the importance of chemical and volcanic processes in nature gained wide recognition among geologists. His chief writings are *Versuch einer mineralogischen Beschreibung von Landeck* (1797; trans. into French, 1805; and into English as *An Attempt at a Mineralogical Description of Landeck*, 1810); *Geognostische Beobachtungen auf Reisen durch Deutschland und Italien* (2 vols., 1802-09); *Reise durch Norwegen und Lappland* (1810); *Physikalische Beschreibung der Canarischen Inseln* (1825); *Beiträge zur Bestimmung der Gebirgsformationen in Russland* (1840); besides several monographs on paleontological subjects. He was also the author of an excellent geological chart of Germany and the neighboring states, published in 42 plates (2d ed., 1832). Consult an Eng. trans. of Flourens, "Mémorial de Leopold von Buch," in the *Smithsonian Report* (Washington, 1862).

BUCHAN, бүк'an, ALEXANDER (1829-1907). A Scottish meteorologist, born at Kinnesswood, Kinross-shire. He was educated at Edinburgh University, was a teacher from 1848 to 1860, and in the latter year was appointed secretary to the Scottish Meteorological Society. He was largely responsible for the acceptance of Buys Ballot's theory of the relation of wind to air pressure; was the first to trace the path of a "depression" across the Atlantic and to reach scientific conclusions as to "the mean pressure of the atmosphere and the prevailing winds over

the globe." He has published contributions on "Atmospheric Circulation" and "Oceanic Circulation" to the reports of the *Challenger* expedition; *A Handy Book of Meteorology* (1867), and an *Introductory Text-Book of Meteorology* (1871). Consult the biographical sketch by W. N. Shaw in *Nature* (May 23, 1907).

BUCHAN, DAVID (1780-c.1837). An English naval officer and explorer. He became lieutenant in 1810, and commander in 1816. In 1811 he explored Newfoundland, of which he became high sheriff in 1825. In 1818 he had commanded the expedition sent by the Admiralty for the discovery of the North Pole. With the *Dorothea* and the *Trent* (commanded by Lieut. John Franklin), he reached lat. 80° 34' N., but his ship was injured by pack ice, and he was obliged to make for Deptford. During a second expedition his ship was lost at sea. He investigated the compression of the earth at its poles and deep-sea and surface temperatures.

BUCHAN, EARL OF. See ERSKINE, D. S.

BUCHAN, ELSPETH (1738-91). A Scottish religious enthusiast. See BUCHANITES.

BUCHAN, WILLIAM (1729-1805). A Scottish physician, born at Ancrum. He practiced in Edinburgh from 1766 to 1778, when he removed to London. He published *Domestic Medicine* (1769), which was the first popular work of the kind, and was translated into many European languages. He was buried in Westminster Abbey.

BUCHANAN, bù-kán'an, FRANKLIN (1800-74). An American naval officer, prominent in the Confederate service during the Civil War, born in Baltimore, Md. He entered the United States navy at the age of 15; became a lieutenant in 1825, and in 1841 was promoted to the rank of master commandant. In 1845 he organized the United States Naval Academy at Annapolis under the direction of the Secretary of the Navy and for two years acted as its first superintendent. He then served in the Mexican War, commanding the *Germantown* during the siege of Vera Cruz, and in 1852-53 commanded Commodore Perry's flagship, the *Susquehanna*, in that officer's famous expedition to Japan. He was promoted to be captain in 1855 and was placed in command of the Washington navy yard in 1859, but in 1861 (April 22) he resigned on the assumption that his State would soon secede from the Union. Maryland remained loyal, however, and he asked to be restored, but his request was refused by Secretary of the Navy Welles, and in September, 1861, he received a captain's commission in the Confederate navy. He commanded the *Merrimac* in the attack upon the Federal fleet in Hampton Roads and was severely wounded. Soon afterward he was promoted to the rank of admiral, and for some time was senior officer in the Confederate navy. In 1863 he became commander of the naval defenses of Mobile, Ala., and in this capacity constructed the ironclad ram *Tennessee*. In August, 1864, he commanded the Confederate fleet in Mobile Bay, so thoroughly defeated after a desperate struggle by Farragut (see MOBILE BAY and FARRAGUT, DAVID GLASGOW), and on this occasion lost a leg and was taken prisoner, though he was soon afterward exchanged. After the war he was for some time president of the Maryland Agricultural College.

BUCHANAN, GEORGE (1506-82). A Scottish historian and poet, noted as tutor of James VI. He was born of poor parents in Killearn,

Stirling, February, 1506. He was sent to the University of Paris by his uncle, who died two years afterward, leaving Buchanan without the means of prosecuting his studies. He returned home and, at the expense of his health, fought against the English, being present at the siege of Werk, October, 1523. He entered St. Andrews University as a pauper student in 1524, in the following year taking his degree of B.A. In 1526 he went to Paris, was admitted B.A. at the Scots College on Oct. 10, 1527, and attained his M.A. degree in March, 1528. He subsequently obtained a professorship in the College of St. Barbe, but returned to Scotland about 1536. During his residence on the Continent Buchanan adopted the Reformed faith. A satire entitled *Somnium*, arraigning the Franciscans, aroused their indignation, and he resolved upon seeking safety in his old college in Paris, when King James V took him under his protection and intrusted him with the education of one of his illegitimate sons. At the request of the King Buchanan wrote another satire against the monks, entitled *Franciscanus* (1564), increasing their natural resentment and bringing upon himself the powerful displeasure of Cardinal Beaton, who had him arrested and imprisoned for his diatribe. Though the publication of the satire was due to James, he did not protect the poet, who escaped to Paris. After spending some years in Bordeaux and Paris in tuition, he accompanied the learned Portuguese Govea to the University of Coimbra, in Portugal. After the death of Govea Buchanan was arrested as a heretic and was for some time detained in a monastery, where he began his splendid Latin metrical version of the Psalms. Restored to liberty in 1551, he went to England, but soon afterward again sought Paris. About 1561 he returned to Scotland and made confession of Protestantism. His reputation as a scholar gained him a good reception at the court of Mary, whose classical tutor he became. But his religious and political principles attached him to the party of the Regent Moray, by whose influence he was appointed principal of St. Leonard's College, in St. Andrews University, in 1566, the complimentary inscription on the register reading "Hujus sæculi poetarum facile princeps." In the following year he was chosen moderator of the General Assembly—a rare honor for a layman. Siding as he did with the Reform party, Buchanan arrayed himself against Mary, and he accompanied Moray to England, to give evidence before the commissioners appointed by Elizabeth to inquire into her guilt. His *Detectio Mariæ Reginae*, which was possibly laid before these functionaries, was industriously circulated by the English court. It, however, contains gross exaggerations, which have been condemned by partisan as well as non-partisan historians. In 1570 Buchanan was appointed tutor to James VI (afterward James I), who owed to him the erudition of which in later life he was so pedantically vain. No considerations of the future position of his pupil were allowed to interfere with Buchanan's treatment of him, which was strict, if not even stern. In dedicating his *De Iure Regni apud Scotos* to the young monarch in 1579, he warned him against favorites with remarkable freedom, and his dictum that "Kings existed by the will of the people" was of special import in the succeeding century. In 1570 Buchanan was appointed Director of Chancery and Keeper of the Privy Seal. He

resigned office in 1578 and devoted the rest of his life to the composition of his *History of Scotland* (published in 1582). He died 30 days after its publication, on Sept. 28, 1582, and received public burial in Greyfriars Churchyard, Edinburgh. As a scholar, Buchanan was unrivaled in his age, and he wrote Latin poetry "with the purity and elegance of an ancient Roman."

He was alike humorous, sarcastic, and profound. His *History*, written in Latin, is remarkable for the richness, force, and perspicuity of its style, though its narration of contemporary events shows partiality. Two years after the author's death, it, as well as *De Iure Regni*, etc., was condemned by the Scottish Parliament, and every person possessed of the copies was ordered to surrender them within 40 days, in order that they might be purged of "the offensive and extraordinary matters" they contained. The latter work was again condemned in 1664, and in 1683 was burned by the loyalist scholars of Oxford. Two collected editions of Buchanan's works have been published—one by Ruddiman (2 vols., Edinburgh, 1715) and another by Burmann (2 vols., Leyden, 1725). Translations that have appeared do little justice to the original. Consult Dr. Irving, *Memoirs of the Life and Writings of George Buchanan* (2d ed., Edinburgh, 1817), and P. Hume Brown, *George Buchanan* (London, 1890).

BUCHANAN, GEORGE (1827-1905). A Scotch surgeon and author. He was appointed surgeon to the Royal Infirmary of Glasgow, accompanied the British forces as a civil surgeon during the Crimean War, and in 1860 became professor of anatomy in the Andersonian University, where he came to know Lister and his antiseptic methods. He was a daring surgeon and a pioneer in the use of new methods in operations. From 1874 he was professor of clinical surgery in the University of Glasgow, but in 1900 resigned the chair. He edited the tenth edition of the *Anatomist's Vade Mecum* and published *On Lithotripsy* (1880), *Talipes Varus* (1880), and other technical works, and an important article entitled "Anæsthesia Jubilee: a Retrospect" (1897) in the *Edinburgh Medical Journal*.

BUCHANAN, ISAAC (1810-83). A Canadian pioneer merchant, publicist, and statesman. He was born in Glasgow, Scotland, and was educated at the grammar school in that city. He early entered commercial life and was taken into partnership by his Glasgow employers, who in 1830 sent him to Montreal to establish a branch of their business. The next year he opened another branch in Toronto and shortly afterward branches in Hamilton and London (Ont.). Buchanan thus became the pioneer of the wholesale trade in Upper Canada. He took a keen interest in politics, supporting the party of responsible government, and opposing sectarian privilege as embodied in the Clergy Reserves. (See CANADA, *History*.) In 1841 he was elected to the Legislative Assembly of Canada, but refused to become an adherent of either political party, and resigned his seat in 1843. For 15 years he remained out of Parliament, engaged in large business operations. In 1845 he was chief promoter of the construction of the Great Western Railway of Upper Canada. He wrote many articles and pamphlets on financial and economic questions and was an opponent of hard money and free trade. He believed that the labor and money problems are inseparably connected and that the solution of the one was the solution of

the other. His indefatigable zeal in advocating protection entitles him, in the opinion of many, to be called the founder of that system in Canada. In 1864 he entered the second Taché-Macdonald ministry as President of the Council, but shortly afterward resigned. In 1878 he was appointed a Dominion arbitrator, a position in which he continued for the remainder of his life.

BUCHANAN, JAMES (1791-1868). The fifteenth President of the United States (1857-1861). He was born near Mercersburg, Pa., April 23, 1791; graduated at Dickinson College in 1809; was educated for the bar, and began to practice law in Lancaster, Pa., in 1812. Though a professed Federalist, he served as a private in the second war with England. In 1814, as also in 1815, he was a member of the Pennsylvania Legislature, and in 1820 was elected to Congress, where he served through five terms. In 1828 he favored Jackson for President, and in the Congress of 1829-31 made important proposals as chairman of the Committee on the Judiciary. After leaving Congress he was sent by Jackson as Minister to Russia, where he concluded the first commercial treaty between the two countries, securing valuable privileges in the Black and Baltic seas. Returning home in 1833, he was in the following year chosen to the United States Senate, to which he was twice reelected. He uniformly supported Jackson, especially in the latter's claim that as President he had power to remove executive officers without reference to the Senate, and in his financial measures.

When it was proposed to exclude from Congress petitions for the abolition of slavery, Buchanan upheld the right of petition, but declared that Congress had no control over slavery in the States, and that petitions for the abolition of slavery in the District of Columbia should be uniformly rejected. He favored the bill prohibiting the use of the mails for the distribution of abolitionist literature. He supported the "expunging resolution" of Senator Benton, and in the affair of the American claims on France he supported Jackson's emphatic demand for payment and his implied threat of war in case of a persistent refusal on the part of the French government. During Van Buren's administration Buchanan supported the independent treasury scheme and favored the preemption of public lands.

He sustained the veto power under Tyler and opposed the ratification of the Ashburton Treaty, which settled the dispute concerning the northeastern boundary. When the question of the annexation of Texas came to the Senate, Buchanan was the only member of the Senate Committee of Foreign Affairs to report in favor of annexation. He had declined the office of Attorney-General in 1839 and in 1844 was mentioned for the presidency. Finally he left the Senate in 1845 to become Polk's Secretary of State. In this capacity he had to deal with the northwestern boundary question, whence arose the famous partisan cry "Fifty-four forty or fight." Both England and the United States had formally claimed the territory between the Pacific coast and the Rocky Mountains up to the Russian boundary, but after much negotiation the line of 49° was agreed upon. During the war with Mexico Buchanan was successful in avoiding or preventing the interference of other nations. He was in private life during the discussion and adoption of the Compromise

Measures of 1850, but fully approved them. When Pierce became President, in 1853, Buchanan was sent as Minister to Great Britain, where he was engaged in endeavors to settle a series of questions concerning Central American affairs. With J. Y. Mason and Pierre Soulé he signed the Ostend Manifesto (q.v.), recommending the acquisition of Cuba, but although the measure was so evidently proslavery in tendency and unjust to Spain that it met with the disapproval of Marcy, the Secretary of State, nevertheless it helped Buchanan to gain the Democratic nomination for President, while his absence in England during the Kansas-Nebraska excitement was also in his favor, and he was nominated in 1856, with Mr. Breckenridge of Kentucky for the vice presidency, the two candidates being popularly known as "Buck and Breck." The electoral vote was: for Buchanan, 174; for John C. Frémont (candidate of the newly organized Republican party), 114; for Millard Fillmore (Native American), 8. The popular vote was: Buchanan, 1,838,169; Frémont, 1,341,264; Fillmore, 874,534; majority against Buchanan, 377,629; plurality for him, 496,905. He had the votes of every slaveholding State except Maryland, which went for Fillmore. The vote also gave Buchanan Indiana, Illinois, Pennsylvania, California, and New Jersey. In the executive chair he was apparently subservient to Southern politicians and allowed their threats of secession to influence his actions. After Lincoln's election Buchanan was more than ever anxious to stifle the slavery discussion and in his last message to Congress pointedly charged the North with having brought about the existing crisis in national affairs by a discussion which had "produced its malign influence on the slaves, and inspired them with a vague idea of freedom." While holding that the States had no right to secede, he added that the nation had no power to prevent it; he said it could not employ force, except upon the demand of the lawful authorities of the State, and in South Carolina no such authority then existed. A few days later he was confronted by commissioners from South Carolina (that State having passed an act of secession on Dec. 20, 1860), who came to demand the surrender by the President to the seceded State of all public property, and to negotiate for the continuance of "peace and amity between that Commonwealth and the government at Washington." His reply was that he had no power and could only refer the matter to Congress; he could only receive them as "private gentlemen of the highest character" and treat respectfully such propositions as they might make. He did, however, decline to accede to their demand for the removal of the troops from Charleston harbor. The cabinet was immediately reorganized. Cass was Secretary of State, but resigned when the President refused to order reinforcements to the Charleston forts; the Secretary of the Treasury and the Secretary of the Interior had already gone, and the Secretary of War also resigned. Under the influence of the reorganized cabinet, including J. S. Black, John A. Dix, J. Holt, and E. M. Stanton, Buchanan displayed less timidity, attempted a reinforcement of Sumter, refused to surrender the United States property to South Carolina, and announced his intention to protect it if assailed—measures which gained for his administration during its last months more of the confidence of the nation. After the accession of

Lincoln Mr. Buchanan wrote to John A. Dix: "The present administration had no alternative but to accept the war initiated by South Carolina or the Southern Confederacy. The North will sustain the administration almost to a man, and it ought to be sustained at all hazards."

Buchanan's administration was marked by considerable activity in diplomatic affairs. He secured a satisfactory commercial treaty with China and the recognition by England of the rights of neutral ships, which had been vigorously asserted by Daniel Webster in a memorandum affixed to the Ashburton Treaty. Relations with Mexico continued to be important as well as unsatisfactory. In his attitude toward the struggle in Kansas and his action upon the Lecompton Constitution (q.v.) Buchanan subjected himself to severe criticism. In fact, Mr. Buchanan is still generally regarded as having been almost unpatriotic in the gloomy days which preceded the outbreak of the Civil War. His policy very accurately reflected the divided counsels of the North. No one had a definite conception of what was needed, and only the most advanced believers in secession, such as Jefferson Davis and Robert Toombs at the South and Fernando Wood in the North, had clearly outlined a definite plan. Buchanan's cabinet was no less divided than the nation. It represented conflicting ideas and principles. Floyd, from the South, proved to be an embezzler. Toucey, a Connecticut Yankee, was secretly a traitor and, as Secretary of the Navy, scattered fleets far over the seven seas, so that the United States should be unable to concentrate an effective naval force in the event of possible hostilities. No one among the masses, at either North or South, believed that war would come. Even Lincoln's first inaugural reflects the same spirit of conciliation and doubt. But Buchanan was a strong patriot at heart, as has been shown already in his letter to General Dix, whom he appointed Secretary of the Treasury and to whom is ascribed that stirring telegram which was flashed to New Orleans: "If any man attempts to haul down the American flag, shoot him on the spot!" It needed the thunder of the cannon at Fort Sumter to consolidate national sentiment; and Mr. Buchanan is not to be censured for a policy which was of necessity the only policy that for the moment was possible.

Shortly after his retirement he published what may be termed a defense, entitled *Mr. Buchanan's Administration on the Eve of the Rebellion* (New York, 1866). The chief authority for his life is the *Memoir* by George Ticknor Curtis (2 vols., New York, 1883). In 1888 the messages of Mr. Buchanan were collected and published by J. Buchanan Henry, with an appendix containing a number of letters from members of his cabinet at the close of his presidential term (New York, 1888). Consult Rhodes, *History of the United States*, from the *Compromise of 1850*, vols. i and ii, for a trustworthy but unduly severe account. John Bassett Moore has edited *The Works of James Buchanan*, comprising his *Speeches*, *State Papers*, and *Private Correspondence* (Philadelphia and New York, 1908-11). He died in Lancaster, Pa., June 1, 1868. See UNITED STATES.

BUCHANAN, JOHN YOUNG (1844-). An English chemist, born in Scotland. He was educated at the universities of Glasgow, Marburg, Leipzig, and Bonn, and at the Ecole de

Médecine, Paris. As chemist and physicist he was a member of the *Challenger* expedition (q.v.), and later he lectured on geography at the University of Cambridge. His publications include *Chemical and Physical Notes* (1901) and *Experimental Researches on the Specific Gravity and the Displacement of Some Saline Solutions* (1912).

BUCHANAN, ROBERT CHRISTIE (1811-78). An American soldier. He was born in Baltimore, Md.; graduated at West Point in 1830; took part as second lieutenant in the Black Hawk War of 1832, being in command of the gunboats on the Wisconsin during the battle of Bad Axe River; and in 1837-38 served in the Florida, or Seminole, War. In the Mexican War he participated in both the Northern and the Southern campaigns, and was brevetted major and lieutenant colonel. Soon after the outbreak of the Civil War he was promoted to be lieutenant colonel, and in 1862 commanded a regiment, and later a brigade, in the Peninsular campaign. From November, 1862, to March, 1863, he served as a brigadier general of volunteers in the Rappahannock campaign and at the close of the war he was brevetted brigadier general in the regular army for gallantry in the battle of Malvern Hill, and major general for gallantry in the second battle of Bull Run and the battle of Fredericksburg. He commanded the District of Louisiana from January, 1868, to January, 1869, and the Department of Louisiana from January to March, 1869, and in 1870 retired from the service.

BUCHANAN, ROBERT WILLIAMS (1841-1901). An English author. He was born in Caverswall, Staffordshire, son of an Owenite lecturer; was educated at the University of Glasgow, shared hardships in London with his fellow student, David Gray (q.v.), and became a journalist. His first publication, *Undertones* (1862), a collection of verse, was followed by *Idyls and Legends of Inverburn* (1865) and by *London Poems* (1866). His poems were published complete in 1901 (2 vols.). In the drama his most noteworthy success was *Sophia*, an adaptation of *Tom Jones*; and in 1876 he wrote his first novel, *The Shadow of the Sword*. *The Land of Lorne* (1871) was an excellent description of the west coast of Scotland. In 1880 he visited America. In verse he displayed an unstudied strength of genius, but by degrees grew assertive and egoistic, as in *The Wandering Jew* (1893). He was an acute critic, but had the same bias and intolerance in criticism as in his later poetry. His article, "The Fleshly School of Poetry: D. G. Rossetti," in the *Contemporary Review* for October, 1871, with the signature Thomas Maitland, charged Rossetti's sonnets with being immoral. Rossetti replied harshly in a letter in the *Athenæum* (Dec. 16, 1871), called "The Stealthy School of Criticism." Swinburne's *Under the Microscope* (1872) even more savagely attacked Buchanan, who reprinted (1872) over his own signature the original critique with additions. He retracted later, and dedicated to Rossetti, "an old enemy," his novel *God and the Man* (1881). "The Voice of the 'Hooligan,'" an arraignment of Rudyard Kipling, in the *Contemporary* for December, 1899, proved again that his chief defect was one of taste; he was qualified for creative work, but he preferred "slashing" criticism. Many of his fugitive writings were collected in *A Look round Literature* (1887). Consult *Robert Bu-*

chanan (London, 1903), by Harriett Jay, who wrote with him a melodrama, *Alone in London*.

BUCHANITES, buk'an-its. An extraordinary sect of fanatics, which sprang up in the west of Scotland in 1783, but has now become extinct. The founder of the sect was Elspeth Simpson, the daughter of John Simpson and Margaret Gordon, and she was born at Fatmacken, near Banff, northeast Scotland, where her father kept an inn, in 1738. She married Robert Buchan, a potter of Greenock, but not being happy with him, she removed with her children to Glasgow in 1781 and subsequently was divorced from him. In Glasgow, in 1783, she became acquainted with the Rev. Hugh White, minister of the Relief congregation in Irvine, 10 miles north of Ayr, a weak, vain man and a coarse declamatory preacher, and moved to Irvine to be in his congregation. She converted him and his wife to the belief that she was the woman mentioned in Rev. xii. and that he was the man child whom the woman bore. She also claimed to be able to impart the Holy Ghost by breathing. A little company of believers in their claims, and others of like nature, was collected. Then the customary persecutions began and the customary village gossip that their meetings were licentious orgies. Robert Burns, in a letter to J. Burness in August, 1784, repeats the tale. White was deposed from the ministry and the company banished from the burgh. They went about 50 miles southeast and settled at New Cample, 10 miles north by west of Dumfries. There Mrs. Buchan died in May, 1791. With White she compiled a *Divine Dictionary* (1785). The sect, which never numbered more than a handful, became extinct in 1848. Consult Train, *The Buchanites from First to Last* (Edinburgh, 1846).

BUCHAREST (Rumanian, *București*), boo'ka-rést'. The capital of Rumania, situated on both sides of the Dimbovitza, in lat. 44° 25' N. and long. 26° 7' E. (Map: Balkan Peninsula, F 2). The two parts of the city are connected by 12 bridges, 5 of iron and 7 of stone. The general appearance of the city, with its green gardens and numerous church cupolas, is very attractive, although many of the streets are narrow and crooked, still retaining some of their Oriental characteristics. These streets, however, are confined mostly to the suburbs, and the city itself is practically modern. The fortifications of Bucharest, completed in 1896, are very extensive and formidable, containing 18 forts and forming a circle of over 40 miles in circumference around the city. The Plevna, Lipsescani, Vacaresci, Elizabeth Boulevard, and the Calea Victoriei are main thoroughfares, well laid out and lined with numerous fine buildings. Bucharest contains over 120 churches, mostly Greek Orthodox. The prominent secular buildings are the royal palace, the university, the national theatre, the palace of justice, and other government buildings, besides numerous private palaces. Bucharest has some fine monuments, including one to Joan Heliade-Radulescu, the father of Rumanian literature, and one to the voivode Michael the Brave.

Most of the manufacturing establishments are in the hands of Germans, Hungarians, and other foreigners. The chief manufactured products are refined petroleum, vegetable oils, brandy, army supplies, flour, beer, soap, candles, brick, some textiles, and iron articles. The commerce

is highly developed, Bucharest being the centre of a large transit trade in petroleum, cereals, and timber. Bucharest is administered by a town council consisting of 17 members. The water supply and the sewers are inadequate, and some of the streets are lighted by gas or oil. Electricity has been introduced. For local transportation there are horse-car and electric tramways.

The chief educational institutions are the university; the veterinary institute; the Rumanian Academy, with valuable collections and a library; the museum of zoölogy, anthropology, and ethnology; the botanical museum; the museum of antiquities; and the Rumania Geographical Society. The charitable institutions are numerous, and include 10 public hospitals, a number of poorhouses, and kitchens for the poor. Pop., census of Jan. 1, 1913, 338,109 (276,178 in 1899). Bucharest was visited by the plague in 1718, 1738, 1793 (also an earthquake year), and 1813 (70,000 victims in six weeks).

Bucharest became the residence of the Princess of Wallachia at the end of the fourteenth century. It was captured by the Russians in 1769, but was returned to the Turks, and it was taken by the Austrians in 1789 and held for two years. On May 28, 1812, a treaty was concluded here between Russia and Turkey, by which the former obtained Bessarabia, the Pruth being made the boundary between the two empires. During the wars with Turkey, however, Russia occupied the city again, once in 1828 and once in 1854. In 1862 Bucharest became the capital of Rumania, which had just been formed from the union of Moldavia and Wallachia. In 1866 a revolt in Bucharest dethroned the first ruler of United Rumania. The partition of the captured parts of European Turkey was settled among the Christian states of the Balkans by the Treaty of Bucharest, Aug. 10, 1913. Consult Damé, *Bucarest en 1906* (Bucharest, 1907). See BALKAN WAR.

BUCHAREST, UNIVERSITY OF. The State university of Rumania. It was founded in 1864 and in 1912 had over 3200 students in mathematics and science, philosophy, law, medicine, and theology. It comprises, also, a school of pharmacy and a number of laboratories and museums. Tuition is absolutely free in all departments of this university. The library contains over 26,000 volumes.

BÜCHELER, buk'e-lër, FRANZ (1837-1908). A German classical scholar. He was born in Rheinberg, studied in Bonn, became professor in Freiburg in 1858 and in Greifswald in 1866; in 1870 he was called to Bonn. His investigations in the department of ancient Italian dialects are very valuable. Especially important is his *Grundriss der lateinischen Deklination* (1866; a new edition was brought out by Windelkide, with the admirable additions of the French translator, Havet, in 1879). He also published editions of Frontinus, *De Aquis Urbis Romæ* (1858); *Pervigilium Veneris* (1859); *Petronius* (editio maior, 1862; the editio minor has reached a 4th ed.); the *Hymnus Cereris Homericus* (1869); the *Reliquiæ* of Quintus Cicero (1869); and *Herondæ Mimiambi* (1892). In 1878 he became one of the associate editors of the *Rheinisches Museum für Philologie*. With Zitelmann he published *Das Recht von Gortyn* (1893); he brought out also two revisions of Otto Jahn's edition of Persius, Juvenal, and

Sulpicia (1886; 1893). He was renowned equally for his great learning, his discriminating critical talent, and his skill as a teacher.

BUCHER, böö'ér, ANTON VON (1746-1817). A German author, known for his polemics against the Jesuits and for his labors in behalf of the German schools. He was born in Munich, studied in Ingoldstadt, and took orders. In 1771 he was appointed rector of the German schools of Munich. He was bitterly antagonized by the Jesuits and finally was removed from his position (1778) by Maximilian Joseph II who, however, compensated him by bestowing upon him the benefice of Engelbrechtsmünster. Here he published his satires against the Jesuits, such as *Charfreitagssprossion*, *Spottspiel von der Sündflut*, and *Die Jesuiten auf dem Lande*. His collected works were published (5 vols.) in 1819-20.

BUCHER, LOTHAR (1817-92). A German diplomat, born in Neustettin (Pomerania). He was educated at the University of Berlin and in 1848 entered the Prussian National Assembly for the city and district of Stolp. In 1850, under political charges, he fled to England, where he acted as correspondent for the *National Zeitung*. After his return to Germany he was appointed by Bismarck to a post in the Foreign Office and obtained the rank of reporting councilor in the Ministry for Foreign Affairs. He enjoyed unusually close relations with the Chancellor, aided him greatly in his later economic policies, assisted him in diplomatic measures, and helped him to write his *Memoirs*. In 1876 he was made a Privy Councilor. His publications include *Bilder aus der Fremde* (2 vols., 1862-63), a selection from his contributions to the *National Zeitung*, and *Kleine Schriften politischen Inhalts* (1893). Consult *Das Leben und Werke*, by Poschinger (3 vols., Berlin, 1890-94).

BUCHEZ, bü'shâ', PHILIPPE JOSEPH BENJAMIN (1796-1865). A French political and social philosopher. He was born in Matange-la-Petite (then in the department of Ardennes, now in Belgium), studied medicine, was admitted to practice as a physician in 1825, and was interested, as an opponent of the Bourbon restoration, in the organization of the French Carbonari Society. The discovery of the conspiracy led to his arrest, and his release was obtained only by a disagreement among the judges. He then became chief editor of the *Journal des Progrès des Sciences et Institutions Médicales*, and a collaborator on the *Producteur*, a periodical in advocacy of the doctrines of Saint-Simon. Upon the assumption by the Saint-Simonians of the form of a religious society, with a peculiar ritual and with heterodox creed and views of morality, Buchez withdrew and founded *l'Européen*, later called *La Revue Nationale*, in which, as well as in his *Introduction à la science de l'histoire* (1833), he expounded his system, styled by himself "Bucheism." This system is essentially communistic; its basis is the free association of labor, and the idea that private property in land should be abolished and inheritance narrowly restricted. Buchez is distinguished from other communistic reformers of his day by the emphasis he places upon moral development, both as means and end of social reform. He maintained that his system was fundamentally in accord with Christianity, and was in a sense the logical outcome of the Christian religion. He is accordingly to be classed with the Christian Socialists of a later

period. After the Revolution of 1848 Buchez was for a short time deputy mayor of Paris and was elected to the Constituent Assembly, of which he became President. His publications include the extensive compilation, *L'Histoire parlementaire de la Révolution française*, with Roux Laverne (40 vols., 1833-38); *Essai d'un traité complet de philosophie au point de vue du catholicisme et du progrès* (1840); *Histoire de la formation de la nationalité française* (1859); *Traité de politique et de science sociale* (1866). Consult Castella, *Buchez, historien* (Paris, 1909).

BUCHHOLZ, böög'höls. A town of Saxony, Germany, on the river Sehma, 18 miles southeast of Chemnitz. Its principal building is the fine Gothic church of St. Catherine, which contains some good paintings. The town owes its origin to its silver mines, discovered in 1497. The industries include wood-pulp and paper-making mills, lace and embroidery mills, and bookbinding establishments. Its lace making dates from 1589 and is the chief occupation of the inhabitants. Pop., 1900, 8402; 1905, 9307.

BUCHHOLZ, böög'höls, REINHOLD (1837-76). A German zoölogist and traveler. He was born in Frankfurt-on-the-Oder and studied medicine in Greifswald and Berlin. He accompanied the North Polar expedition of the *Hansa* (1869-70), which is described in his book *Erlebnisse der Mannschaft des Schiffes Hansa bei zweiten Deutschen Nordpol fahrt* (1871), and in 1872 made an unsuccessful attempt to explore the mouths of the Niger. He became professor of zoölogy in Greifswald in 1872 and director of the zoölogical museum in 1876.

BUCHHOLZ FAMILY, THE (Ger. *Die Familie Buchholz*). Entertaining sketches of middle-class life in Berlin by the German author Julius Stinde. They depict the petty interests and strivings of the family in a life-like and amusing fashion and have been exceedingly popular in Germany, reaching the eighty-fifth edition in 1900. The author pursued the same vein less successfully in *Wilhelmina Buchholz's Memoirs*; *The Buchholzes in Italy*, *Paris*, *the Orient*, etc.

BUCHLOË, bü'klö-ä. See BUFFALO GRASS.

BUCHNER, böög'nér, EDUARD (1860-1917). A German chemist, born in Munich. He studied at the universities of Munich and Erlangen, was made lecturer in chemistry at Munich in 1891, professor at Kiel in 1893, at Tübingen in 1896, and at the Agricultural College of Berlin in 1898. In 1907 he received the Nobel prize in chemistry, and in 1909 became professor at Breslau. He was made a Privy Councilor in 1910. His reputation is based on his remarkable discovery that the liquid obtained by crushing yeast with fine quartz sand and subjecting the mass to a pressure of several hundred atmospheres possesses, like yeast itself, the power of setting up "fermentation" in solutions of maltose, grape sugar, invert sugar, etc. This proved that the alcoholic fermentation of sugars is caused immediately, not by the *physiological processes* going on in the organism of the living yeast, but by the purely *chemical action* of an enzyme ("zymase" or "endotrypsin"). Buchner wrote, jointly with his brother Hans (q.v.), *Die Zymasegährung* (Munich, 1903).

BÜCHNER, бүк'nér, FRIEDRICH KARL CHRISTIAN LUDWIG (1824-99). A German philosoph-

ical writer, born in Darmstadt. He studied at the universities of Giessen, Strassburg, Würzburg, and Vienna. In 1852 he was appointed a lecturer in Tübingen, but the publication in 1855 of his *Kraft und Stoff* compelled him to resign his post and resume medical practice in Darmstadt. In *Kraft und Stoff* (19th Ger. ed., 1898; an Eng. trans. by Collingwood, 1855; an Amer. ed., 1913, *Force and Matter*, reprinted from the 4th Eng. ed., from the 15th Ger. ed.) he maintained the indestructibility of matter and force; but he likewise insisted on the finality of physical force, identifying brain and mind and denying the existence in nature of either plan or deity. Other works are: *Aus Natur und Wissenschaft* (vol. i, 1862; vol. ii, 1884); *Licht und Leben* (1881); *Fremdes und Eigenes aus dem geistigen Leben der Gegenwart* (1890); *Darwinismus und Socialismus* (1894); and *Im Dienste der Wahrheit* (1899). Consult Frauenstädt, *Der Materialismus* (Leipzig, 1856), and Janet, *The Materialism of the Present Day: A Criticism of Dr. Büchner's System*, trans. by Masson (London, 1867).

BÜCHNER, GEORG (1813-37). A German poet, born in Goddelau, Hesse. He studied at the universities of Strassburg and Giessen. Because of the publication of a brochure on behalf of political liberty, entitled *Der hessische Landbote*, he was compelled to take refuge in Strassburg. Later he went to Zurich, where he became lecturer at the university. His dramatic poem, *Dantons Tod*, appeared in 1835. He also made translations from Hugo, and left in manuscript a comedy, *Leonce und Lena*, full of wit and life, and a *Geschichte der philosophischen Systeme von Cartesius bis Spinoza*. A complete critical edition of his works with his unpublished manuscripts was edited and published by K. E. Franzos (Frankfort, 1879).

BUCHNER, BOGG'NER, HANS (1850-1902). A German hygienist and bacteriologist, brother of Eduard Buchner (q.v.). He was born in Munich, studied at the universities of Munich and Leipzig, and at the former became in 1880 lecturer in hygiene and in 1892 professor. His investigations in the field of bacteriology are numerous and important. In 1877 he demonstrated the resistance offered by the physical organism to microscopic bodies present in states of ulceration, inflammation, and fever; and in 1890 showed this resistance directly to depend upon the presence in the blood serum of certain clearly defined albuminous substances. He wrote: *Die nügelsche Theorie der Infektionskrankheiten* (1883); *Die neue Gesichtspunkte in der Immunitätsfrage* (1892).

BUCHNER, JOHANN ANDREAS (1783-1852). A German pharmacist, born in Munich. He studied pharmacy under Trommsdorff in Erfurt, and in 1818 was appointed professor of pharmacy, toxicology, and the theory of prescription at Landshut. This chair he retained upon the transfer of the university to Munich in 1826. In 1827 he became a member of the Bavarian Academy of Sciences. From 1815 to 1851 he published 110 vols. of his *Reportorium für Pharmacie*, then the most widely circulated periodical of the sort in Germany, and in 1815-18 edited the *Anzeiger für Kunst und Gewerbfleiss in Bayern*. He discovered salicin and berberine (qq.v.) and by his writings greatly aided in the establishment of pharmacy upon a scientific basis. His chief publication was the uncompleted *Inbegriff der Pharmacie* (7 parts, 1821-

36), to which other scientists contributed, and for which he himself wrote an *Einleitung in die Pharmacie* (1821); *Toxikologie* (1822); *Grundriss der Physikalischen Vorbereitung zur Chemie* (1823); *Grundriss der Chemie* (1830-36).

BUCHON, bu'shōn', JEAN ALEXANDRE (1791-1846). A French historian, born at Menetou-Salon (Cher). After extensive travels for the collection of material he published, in 1824-26, his edition of the *Chroniques de Froissart* (15 vols.), a portion of his *Collection des chroniques nationales françaises écrites en langue vulgaire du XIII^e au XVI^e siècle* (47 vols., 1824-29). In addition to some volumes of travel, such as *La Grèce continentale et la Morée* (1843), his very numerous works include: *Chroniques étrangères relatives aux expéditions françaises pendant le XIII^e siècle* (1840); *Esquisse des principaux faits de nos annales nationales du XIII^e au XVII^e siècle* (1840); *Nouvelles recherches historiques sur la principauté française de Morée* (2 vols., 1843-44); *Voyage dans l'Eubée* (published for the first time with biography and bibliography in Paris, 1911).

BUCHSWEILER, böög'svīlēr. The capital of a canton in German Alsace, 20 miles northwest of Strassburg (Map: Germany, B 4). It was the ancient capital of the "Hanauer Ländchen," part of Hesse-Darmstadt, prior to the French Revolution. It has some fine mediæval residences and public buildings, including the Rathaus and the gymnasium. The curious Bastberg Hill is noted for its lignite-mines and fossils. Pop., 1900, 3101; 1910, 2922.

BUCHTA, böög'tā, RICHARD (1845-94). An Austrian explorer, born in Radlow, Galicia. In 1877 he visited Khartum, where Chinese Gordon, then Governor-General, facilitated his journey to Emin Pasha at Ladö, on the Upper Nile. In 1885 he made another tour through Egypt and through the desert to Fayum. He was a collaborator on the first volume of Junker's work on Africa and published the following works: *Die obere Nilländer*, etc., with 160 photographic views (1881); *Der Sudan und der Mahdi*, *Das Land, die Bewohner und der Aufstand* (1884); *Der Sudan unter ägyptischer Herrschaft* (1888).

BUCHTEL, būk'tel, HENRY AUGUSTUS (1847-). An American public official and educator, born near Akron, Ohio. He graduated from Asbury (now De Pauw) University in 1872, was ordained to the Methodist Episcopal ministry, and served for a year as a missionary in Bulgaria. Thereafter he occupied many pastorates in Indiana, Colorado, and New Jersey until 1900, when he was chosen chancellor of the University of Denver. He took an interest in State politics as a reformer and in 1907 was elected Governor of the State on the Republican ticket, serving until 1909. He then returned to his duties as chancellor.

BUCHTEL COLLEGE (after John R. Buchtel). A coeducational college founded in 1872 at Akron, Ohio, by the Universalist State Convention of Ohio. It offers courses leading to the degrees of A.B., Ph.B., and B.S., and maintains an academy.

In April, 1913, the trustees offered the entire plant and endowment of the college to the city of Akron as the nucleus of a municipal university. The offer was accepted by the city in August, and the new "University of Akron" came into existence on Jan. 1, 1914. The name of Buchtel College will be retained for the College of Liberal Arts. In 1913 the value of the

college buildings and grounds was \$300,000. The college faculty numbered 19, and the students 200. The library contains 10,000 volumes. President, Parka R. Kolbe.

BUCHU. The leaves of *Barosma betulina* (natural order Rutaceæ), a plant native to South Africa. Buchu is used in medicine as a diuretic and as an expectorant, on account of its stimulant effect on the respiratory and genito-urinary mucous membrane. The active principle is a volatile oil, but the leaves also contain a considerable amount of mucilage, and therefore are slightly soothing. The drug is used in the form of a tincture and an infusion.

BUCK, CARL DARLING (1866-). An American comparative philologist, born in Bucksport, Me., Oct. 2, 1866. He received the degrees of A.B., 1886, Ph.D., 1889, at Yale University. He was a member of the American School of Classical Studies at Athens in 1887-89 and studied at Leipzig in 1889-92. Since 1892 he has been professor of Sanskrit and Indo-European Comparative Philology in the University of Chicago. He wrote: *Der Vokalismus der oskischen Sprache* (1892); *The Oscan-Umbrian Verb System* (1895); (with W. G. Hale) a *Latin Grammar* (1902); *A Grammar of Oscan and Umbrian* (1904); *Introduction to the Study of the Greek Dialects* (1910). He was a contributor to vol. i of the *Papers of the American School of Classical Studies* (Athens), *American Journal of Philology*, *Classical Philology*, etc.

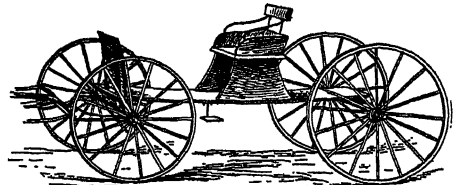
BUCK, CHARLES (1771-1815). An English independent minister. He is remembered for his *Collection of Anecdotes* (1799) and especially for his *Theological Dictionary* (2 vols., London, 1802), which was once one of the most widely used religious reference books and repeatedly republished and reprinted in England and America. At the time of his death he was pastor in London.

BUCK, DUDLEY (1839-1909). An American organist and composer, born in Hartford, Conn., March 10, 1839. From 1858 to 1859 he studied in Leipzig and from 1861 to 1862 in Paris. On his return to the United States he soon became well known as an organist and composer, filling important positions in Hartford, Chicago, and Boston. In 1875 he became organist of Trinity Church, Brooklyn, and also conductor of the Apollo Club, which positions he held till his retirement from musical activity in 1903. After 1905 he made his home in Berlin. Buck's works include a great number of cantatas, among them *The Golden Legend*, which won a \$1000 prize offered by the Cincinnati Music Festival of 1880; a comic opera *Deseret* (1880); a symphonic poem *Marmion*; much church music; organ music (including two sonatas); piano music and songs. Of great value is his *Illustrations in Choir Accompaniment, with Hints on Registration*.

BUCK BEAN, or MARSH TREFOIL (*Menyanthes trifoliata*). A plant of the family Gentianacæ, widely distributed in all the colder parts of the Northern Hemisphere and common in America. It has been described as "perhaps the most beautiful" of all British plants. It grows in marshy places, its creeping rootstocks (or rhizomes) and densely matted roots often rendering boggy ground firm. The leaves are ternate, like those of the trefoils or clovers, and are supported on pretty long stalks. The flower stalk, which is about a foot high, bears a com-

pound raceme of 10 to 20 white flowers, externally tipped with red. The leaves are destitute of smell, but very bitter. From them is prepared a valuable bitter extract, *menyanthin*, which has long been used in cases of dyspepsia and disorders of the bowels and which was also formerly employed in intermittent fevers. An infusion is also sometimes used and sometimes the dried and powdered leaves. The whole plant seems to possess the same bitter and tonic properties. It is sometimes used in Germany as a substitute for hops. The rootstock, which is black and jointed, contains a considerable quantity of starch. For illustration, see **BRAZIL NUT**.

BUCKBOARD (probably so called because of its *bucking* or bouncing). A four-wheeled vehicle in which a platform of long elastic boards is used in place of the ordinary body, springs, and gear. It is fixed as a connection between the fore and rear axles and may have one or more seats. It is thus the most simply



BUCKBOARD.

constructed of any four-wheeled vehicle. Buckboards were first used only in mountain districts where the roads are rugged and were for a long time rudely and simply built. When the Adirondack region and Mount Desert became fashionable resorts, the summer visitors to these places had the primitive buckboards reproduced in more elegant form by carriage builders, so that the buckboard now usually seen differs greatly from the model, being made in handsome woods of a light color, ash or hickory, with springs, silver mountings, and leather cushions.

BUCKE, RICHARD MAURICE (1837-?1901). A Canadian alienist and psychologist. He was born in Methwold, Norfolk, England, but in infancy was brought to Canada by his parents, who settled near London, Ont. He was educated at the London Grammar School and studied medicine at McGill University, where he graduated in 1862. After further studies in London and Paris he returned to Canada and in 1876 was appointed medical superintendent of the asylum for the insane in Hamilton. The next year he took a similar position at the asylum for the insane in London, Ont. He became an authority on mental diseases, and attained a high reputation by his researches in mental evolution. In 1897 he was elected president of the psychological branch of the British Medical Association. His principal publications were: *Mam's Moral Nature* (1879); *Walt Whitman* (1882), a biography; and *Cosmic Consciousness* (1884).

BÜCKEBURG, buk'e-boörk. A garrison town, capital of Schaumburg-Lippe, north Germany, 30 miles southwest of Hanover (Map: Germany, C 2). Its chief features are a ducal palace and castle, a seventeenth-century Lutheran church, and a fine park. Pop., 1905, 5683.

BUCKET (origin uncertain). The name given

in mechanics to the vanes of a water wheel or to the scoop of a dredge or of an elevator for handling grain, coal, etc. See **WATER WHEEL**; **DREDGE**; **GRAIN ELEVATOR**. Buckets for mechanical purposes are made of wood, cast iron, and sheet steel, or other metals.

BUCKET SHOP. An establishment nominally conducted for dealings in stock, grain, or similar commodities, but in fact for the registration of wagers on the rise or fall of the prices of such articles. There is no actual transfer or delivery of the stock or commodity, which is treated as having been bought or sold. The proprietor receives commissions and interest charged and, being secured by the margins deposited by patrons, appropriates such margins, if the market goes against the customer, or pays to the latter his profits when successful. The margins are small, usually \$10 for 1000 bushels of grain, and are wiped out by very slight price fluctuations, even if quotations are fairly made. In many bucket shops the operator withholds quotations favorable to the "speculator" and so deprives him of his meagre chances of winning.

Very large fortunes have been made by certain bucket-shop operators. Their plant consists in private wires to prominent exchanges, from which quotations are supplied to scores of branch offices in small towns. Such offices, known often as "boards of trade" or "exchanges," consist of a room with a blackboard upon which quotations are chalked as they are supplied by the wire.

The bucket shop is generally recognized to be one of the most pernicious forms of gambling, and many efforts have been made to suppress it. In many States laws have been enacted prohibiting the operation of bucket shops, and in some jurisdictions they have been held to be common gambling houses, to be dealt with as such by the police. The legitimate exchanges, notably of Chicago, have been active in the campaign against the bucket shops. So far as possible, the exchanges prevent the bucket shops from securing quotations. It is difficult, however, to frame a law that will destroy the bucket shop without interfering with legitimate speculative transactions, the forms of which are counterfeited by the bucket shop. Consult Hill, *Gold Bricks of Speculation* (Chicago, 1904). See **SPECULATION**.

BUCKEYE. See **HORSE-CHESTNUT**.

BUCKEYE STATE. Ohio. See **STATES**, **POPULAR NAMES OF**.

BUCKHAM, MATTHEW HENRY (1832-1910). An American educator, born in Leicestershire, England. After graduating from the University of Vermont in 1851, and spending several years as principal of Lenox Academy, in Massachusetts, he became professor of Greek at his alma mater (1859) and president of the institution (1871). Among his published addresses and writings are: *The Negro in the United States* (1878); *The Culture of the Imagination* (1909); *Agriculture in the High School* (1910); and a volume of addresses and baccalaureate sermons, *The Very Elect* (1912).

BUCKHANNON, būk-ăn'an. A town and the county seat of Upshur Co., W. Va., 40 miles south of Clarksburg, on the Buckhannon River and on the Baltimore and Ohio Railroad (Map: West Virginia, D 3). It is the seat of the West Virginia Wesleyan College (coeducational) and has flour, lumber, and woolen mills, glass and veneering factories, a brickyard, and

a tannery. Pop., 1890, 1403; 1900, 1589; 1910, 2225.

BUCKHOUND. See **HOUND**.

BUCKIE. A seaport and police burgh of Banffshire, Scotland, on the North Sea, near the entrance to the Moray Firth, 13 miles northeast of Elgin by rail (Map: Scotland, F 2). It has a fine Roman Catholic church with a painting of St. Gregory by one of the Carracci, and there are numerous fine residences in the vicinity. A good modern harbor affords facilities for its fishing industries, which are the most important of the surrounding district. Pop., 1891, 5834; 1901, 6541; 1911, 8897.

BUCKINGHAM, būk'ing-hām. A town in Labelle Co., Province of Quebec, Canada, situated on the Rivière, du Lièvre, near its junction with the Ottawa River, and on the Canadian Pacific Railway, 20 miles east-northeast of the city of Ottawa (Map: Quebec, C 5). It has electric reduction works, and pulp, lumber, and planing mills, a sash and door and a cabinet factory. The town has an electric lighting plant and a system of water works. Phosphate, mica, and plumbago are mined in the vicinity. Pop., 1901, 2854; 1911, 3854.

BUCKINGHAM, DUKE OF. See **STAFFORD, HENRY**.

BUCKINGHAM, DUKES OF. See **VILLIERS**.

BUCKINGHAM, JAMES SILK (1786-1855). An English traveler and editor. He was born in Flushing, near Falmouth, Cornwall, and at 10 years of age went to sea. In 1818 he established the *Calcutta Journal*, which was a commercial success, but because of its strictures on the East India Company was suppressed in 1823, when he was expelled from the presidency of Bengal. His lectures in England against the Company's monopoly and for opening the trade to China, directed attention to the subject. In London he established the *Oriental Herald* (1824) and the *Athenæum* (1828), which he soon sold to John Sterling and F. D. Maurice, and which is now one of the leading weekly critical journals of England. From 1832 to 1837 he was a member of Parliament from Sheffield. He was projector and secretary of the British and Foreign Institute from 1843 to 1846. He wrote *America, Historical, Statistic, and Descriptive* (ib., 3 vols., 1841), other descriptive works on Canada and the United States, and numerous works of travel on the Continent and in the East. Consult his incomplete *Autobiography* (London, 1855).

BUCKINGHAM, JOSEPH TINKER (1779-1861). An American journalist. He was born in Connecticut, was bred a printer, and in 1800 went to Boston, where, six years later, he began *The Polyanthus*, a monthly magazine, which was soon suspended, but was resumed in 1812. In 1809 he published a weekly called *The Ordeal*; from 1817 to 1828 *The New England Galaxy and Masonic Magazine*; and during 1831-34 *The New England Magazine*. In 1824 he established the *Boston Courier*, of which he was editor until 1848. He published *Specimens of Newspaper Literature, with Personal Memoirs, Anecdotes, and Reminiscences* (1850), and *Personal Memoirs and Recollections of Editorial Life* (1852).

BUCKINGHAM, WILLIAM ALFRED (1804-75). An American politician. He was born in Lebanon, Conn., received a common-school education, taught school, worked on his father's farm, and in 1825 began business for himself in Norwich, ultimately accumulating a

geologist in the State Survey of Texas (1860-61), State Geologist of Texas (1866-67), and scientific editor of the *State Gazette, Austin* (1871-72). A list of scientific papers written by him is contained in the *Alumni Record of Wesleyan University* (1883).

BUCKMAN, JAMES (1814-84). An English geologist. He was born in Cheltenham, studied in London, and in 1842 was appointed curator of the Birmingham Philosophical Institute. From 1847 to 1863 he was professor in the Cirencester Agricultural College. He wrote on practical agriculture, botany, archæology, and geology, his geological papers treating chiefly of the stratigraphy and paleontology of the Jurassic series of Somerset, Dorset, and other English districts with which he was familiar.

BUCKMINSTER, JOSEPH STEVENS (1784-1812). An American Congregational clergyman. He graduated at Harvard in 1800 and was afterward a teacher in Phillips Exeter Academy, where Daniel Webster was one of his pupils. In 1804 he was made pastor of Brattle Street Church, Boston; in 1808 he supervised the publication of Griesbach's *New Testament* (in Greek), and in 1811 he was appointed first lecturer on biblical criticism at Harvard. He belonged to the advanced literary Congregational school of his day, that soon after his death became Unitarian. He was a man of remarkable oratorical ability, and his sermons were finished literary productions. He was a member of the famous Anthology Club of Boston and contributed to the *Monthly Anthology*. In 1839 his collected works were published in 2 vols. Consult Lee, *Memoirs of the Buckminsters* (Boston, 1851).

BUCKNELL UNIVERSITY (renamed in 1886, from the University at Lewisburg in honor of William Bucknell, its liberal benefactor). A Baptist institution of liberal arts. It was founded in 1846, at Lewisburg, Pa. The endowment in 1913 was \$1,250,000, and the value of the college buildings over \$523,000. At the same time the faculty numbered 48, and the students 600, of whom one-sixth were in the preparatory departments. The presidents have been Howard Malcolm, LL.D.; Justin R. Loomis, LL.D.; David J. Hill, LL.D.; and John Howard Harris, LL.D. (since 1889).

BUCKNER, SIMON BOLIVAR (1823-1914). An American soldier and politician. He was born in Hart Co., Ky., graduated at West Point in 1844, and was assistant professor of geography, history, and ethics there in 1845-46. He then served in the Southern campaign under General Scott during the Mexican War, and received the brevets of first lieutenant and captain respectively for services at Churubusco and Molino del Rey. In 1860 he was made inspector general of the State and commander of the Home Guards, and on the outbreak of the Civil War he became a brigadier general in the Confederate service. He was the third officer in rank at Fort Donelson at the time of the attack of the Federal army and fleet early in 1862, and Generals Floyd and Pillow withdrawing during the night of February 15, it devolved upon him to surrender the fort and garrison to General Grant. (See **FORT HENRY AND FORT DONELSON**.) In the following August he was exchanged, and subsequently commanded a division under Bragg in Tennessee, and, as major general, took a conspicuous part in the battles of Murfreesboro and Chickamauga. On

May 26, 1865, having previously attained the rank of lieutenant general, he surrendered with Gen. Kirby Smith's army at Baton Rouge, La. After the close of the war he returned to Kentucky, and from 1887 to 1891 was Governor of the State. In 1896 he was the candidate of the National (Sound Money) Democrats for Vice President of the United States on the ticket with J. M. Palmer (q.v.).

BUCKNILL, SIR JOHN CHARLES (1817-97). An English alienist, born at Market Bosworth. He studied medicine at University College, London, and became Lumleian lecturer in the College of Physicians and Surgeons there. He did much to improve the treatment of the insane in hospitals. He originated and edited *The Brain and The Journal of Medical Science*, and wrote: *Unsoundness of Mind in Relation to Criminal Acts* (1857); *The Psychology of Shakespeare* (1859); *The Medical Knowledge of Shakespeare* (1860), and *The Mad Folk of Shakespeare* (1867); *Notes on American Asylums* (1876); *Care of the Insane and their Legal Control* (1880); and, with Sir J. B. Tuke, *Physiological Medicine* (4th ed., 1879).

BUCKRAM (OF. *boquerant, bouqueran*, in popular etymology later referred to *buck*, Ger. *Bock*, goat). A coarse linen or cotton cloth, sized with glue. It is used as a stiffening in making clothing and also in bookbinding. The name was originally applied to a more costly material, which was used for ecclesiastical purposes and for garments.

BUCKSHOT WAR. See PENNSYLVANIA.

BUCKSKIN. A term applied in America to deerskin or sheepskin made soft and pliable by dressing it with oil or brains, and formerly used by the Indians and frontiersmen for clothing, but now consumed almost exclusively in the manufacture of gloves and shoes or used for polishing. It is generally yellow or grayish, but may be dressed so as to have a white color. In England, *buckskin* is used to denote a strong-twilled woolen fabric for breeches.

BUCKSPORT. A town in Hancock Co., Me., 18 miles (direct) south of Bangor, on the Penobscot River, and the Maine Central Railroad (Map: Maine, D 4). It has a good harbor with water transportation throughout the year, and is engaged chiefly in shipbuilding, fishing, the manufacture of barrels and staves, and tanning. Bucksport contains the Buck Memorial Library and the East Maine Conference Seminary. It was settled in 1762 and incorporated in 1792. The government is administered by town meetings, which convene annually. Pop., 1900, 2339; 1910, 2216.

BUCKSTONE, JOHN BALDWIN (1802-79). An English comedian and dramatic writer, born Sept. 14, 1802, at Hoxton, London. Preferring the excitement of the stage to the monotony of an attorney's office, he found an opportunity in a provincial town for the display of his theatrical abilities. After a probation in the country he appeared at the Surrey Theatre in 1823, and his success was so unequivocal that he was soon engaged by the manager of the Adelphi Theatre, where he continued for some years as leading low comedian. In 1840 he visited the United States. He afterward played at the Haymarket, Drury Lane, and Lyceum theatres, of the first of which he was lessee for 23 years, retiring from its management a short time before his death, Oct. 31, 1879. His acting was noted for its comicality and humor,

which never degenerated into vulgarity, and for its distinct appreciation of the peculiar traits in each individual character he assumed. He was a prolific dramatic author as well as an actor. Of the 150 pieces he wrote for the stage several were highly popular at the time of their production. While manager of the Haymarket, he assembled an admirable company of actors, including E. A. Sothorn and the Kendals, and produced, in addition to his own, plays by Gilbert, Tom Taylor, Planché, and Robertson, in most of which he appeared himself. His three children, Lucy Isabella Buckstone (1858-93), J. C. Buckstone (1858-), and Rowland Buckstone (1860-), have all become well known on the stage. Consult Marston, *Our Recent Actors* (London, 1890).

BUCKSTONE, LUCY ISABELLA (1858-93). An English actress, the daughter of John Baldwin Buckstone and sister of John C. Buckstone, also a well-known comedian. At the Haymarket Theatre, London, under her father's management she made her appearance as Ada Ingot in *David Garrick* (1875), after some experience in the provinces. Among her later rôles were those of Annette, in *The Bells*, at the Lyceum; Lucy Ormond, in *Peril*, at the Prince of Wales's Theatre; and Gwendolen Pettigrew, in a successful revival of *The Parvenu*, at the Globe Theatre (1891). She died in London, March 17, 1893.

BUCKTAILS. A name for the members of Tammany Hall from about 1817 to 1826. It also came to be applied to the political party which opposed De Witt Clinton during his campaign for reelection to the governorship of New York State in 1820.

BUCKTHORN (*Rhamnus*). A genus of shrubs or small trees of the family Rhamnaceæ. About 90 species are recognized, which are natives of most of the tropical and temperate regions of the world. The common buckthorn (*Rhamnus cathartica*) is a deciduous shrub or low tree, frequent in England and in other parts of Europe and the north of Asia. The leaves are ovate, crenate, and bright green; the branches spiny; the flowers small, yellowish green, and densely clustered; staminate and pistillate flowers on separate plants; the berries about the size of peas, globular, blue black, nauseous, and violently purgative. They were formerly used much in medicine, but now more rarely, and only in the form of a syrup prepared from their juice. They supply the sap green or bladder green of painters. The bark affords a beautiful yellow dye. The buckthorn is sometimes planted for hedges, but is of too straggling a habit. The alder buckthorn, or berry-bearing alder (*Rhamnus frangula*), is also a native of Great Britain and is frequent in woods and thickets throughout Europe. It is a shrub, rarely a small tree, with spineless branches, oval entire leaves, and small, whitish axillary flowers, which are, in general, somewhat clustered. The charcoal of the wood is light and is used for the preparation of gunpowder. The bark, leaves, and berries are used for dyeing; the bark for dyeing yellow, and, with preparations of iron, black; the unripe berries to dye wool green and yellow; the ripe berries to dye it bluish gray, blue, and green. Both of these species have escaped from cultivation in the United States. There are about a dozen native species in the United States, one of the most important being *Rhamnus purshiana* of the Pacific States, where it is known as *Cascara sagrada*. It is a tree of 15 to 20 feet in

height, and its bark is extensively used in medicine. It contains tannin, three resins, and other principles, and has a considerable reputation as a tonic, vermifuge, and purgative. *Rhamnus californica*, an inferior species, is also sometimes called *Cascara sagrada*. Dyer's buckthorn (*Rhamnus infectoria*) is a low shrub, abundant in the south of Europe, whose unripe fruit yields a brilliant yellow dye. The berries and inner bark of *Rhamnus tinctoria*, a native of Hungary, are also used in dyeing; as also are the berries of *Rhamnus saxatilis*, a procumbent shrub, growing among rocks as far north as Switzerland. The "French berries," "Avignon berries," or "yellow berries" of dyers are the fruit of *Rhamnus infectoria*, *saxatilis*, *olcoides*, and *alaternus*. The sea buckthorn is a shrub of a different family. (See SWALLOW THORN.) *Bumelia lanuginosa*, a small tree with hard wood and useful for hedges, is also called buckthorn.

BUCKWHEAT (*buck*, AS. *bōc*, *bēce*, beech + *wheat*, Ger. *Weizen*, so named in allusion to its triangular seeds, which look like beechnuts). The buckwheat plant belongs to the genus *Fagopyrum* of the order Polygonaceæ, distinguished by the central embryo, and by racemes of flowers grouped in panicles. Common buckwheat (*Fagopyrum esculentum*) is a native of the basin of the Volga, the shores of the Caspian Sea, parts of Central Asia, and the region of the Amur River. Its introduction into Europe took place during the Middle Ages. In the sixteenth century it spread towards the centre of Europe and has since extended over the entire Continent and the British Isles. The plant is upright, branched, 1 to 3 feet in height; the leaves are triangular, heart shaped, or halberd shaped; the flowers pale red, the seed (nut) black and triangular, the angles even (not toothed). It is cultivated as a food and forage plant in Europe and America and very commonly serves as a crop for green manuring. The yearly production of the United States is about 16,000,000 bushels. In Germany buckwheat is much valued as a crop, particularly for moorlands and soils low in fertility. It is of easy cultivation and requires comparatively little nitrogen in the soil, but responds quickly to applications of potash and lime. The average yield is about 20 bushels per acre and the legal weight of the grain per bushel is generally 48 pounds. In America the seed is usually sown broadcast on land plowed in autumn or early spring and well prepared. About a bushel and a half of seed per acre is required when sown broadcast, but a bushel is sufficient if drilled. In the latter case it should not be sown in drills narrower than one foot apart, but two feet is recommended as being better for the succeeding crop, as the wider intervals can be properly cultivated. It should not be sown too early, as the young plants are very sensitive to frost. When the lower seeds are ripe, the crop should be mown to avoid shedding. Wet weather during the harvesting season is more injurious to buckwheat than to most other cereals. Tartarian buckwheat (*Fagopyrum tataricum*), a native of Siberia, is distinguished by the toothed edges of the seeds and its more vigorous growth. It is hardy and very productive, but the seeds when ripe fall out more readily than those of the common species, and the flour is darker colored and somewhat bitter. It is well adapted for green manuring. Notch-seeded buckwheat (*Fagopyrum emarginatum*) is said to be a native of China.

Its seeds are larger than those of common buckwheat, and their angles are winged. When grown in Great Britain, many of its flowers are generally abortive. Perennial buckwheat (*Fagopyrum cymosum*) is a native of Nepal, very vigorous in its growth, but producing, at least in Great Britain, comparatively little seed. The triangular black seed of climbing buckwheat or blackbine (*Fagopyrum convolvulus*) greatly resembles buckwheat, but is smaller. The plant—a very common weed in gardens and cornfields in Great Britain—also exhibits much similarity, notwithstanding its different habits and twining stem. For illustration, see Plate of BRAZIL NUT.

Food Value. The grain of buckwheat and its various by-products are used to a limited extent for feeding farm animals, as are also the green plant and the straw. Buckwheat flour and grits are used as human food. The plants are sometimes grown as bee plants for the honey they furnish, the Japanese buckwheat being especially satisfactory for this purpose. The buckwheat grain has the following percentage composition: water, 12.6; protein, 10; fat, 2.2; nitrogen-free extract, 64.5; crude fibre, 8.7; and ash, 2. It contains rather more crude fibre and less nitrogen-free extract than other common cereal grains. Buckwheat has been successfully fed to pigs, being not quite equal to wheat for this purpose. It does not appear that, as sometimes claimed, it is a cause of soft pork. It is also used as a poultry food. The hulls are woody and have little feeding value. The portion next to the hull, which is known as middlings, has a high feeding value. A mixture of the hulls and middlings, commonly called buckwheat bran, is much inferior to the middlings on account of the admixture of the comparatively worthless hulls. Buckwheat middlings and bran are usually fed to dairy cows. The floury portion of the grain may be regarded as a valuable and economical feed. Green buckwheat forage is sometimes fed to stock, but often has an injurious effect on sheep. The straw is sometimes fed to sheep. Buckwheat flour is proportionately richer in nutrients than is the whole seed, as the crude fibre is practically all removed in milling. It is used very largely in the United States for making griddle-cakes or pancakes, less commonly as a bread-stuff and in other ways. Much is used in the manufacture of prepared flour. In Russia buckwheat porridge is a common article of diet. Buckwheat flour is often adulterated with wheat middlings. This grain has been used for brewing and for the manufacture of distilled liquor.

BUCKWHEAT FAMILY. See POLYGONACEÆ.

BUCKWHEAT TREE. An evergreen shrub, *Cliftonia monophylla*, of the family Cyrillacæ. It grows around ponds and streams in the Gulf States of North America and bears fragrant white blossoms. Its name is derived from the shape of its pendulous fruit.

BUCOLIC (Gk. *βουκολικός*, *boukolikos*, rustic, pastoral, from *βουκόλος*, *boukolos*, cowherd, herdsman). A term derived from the Greek, and long nearly equivalent to the term "pastoral," of Latin derivation. See PASTORAL POETRY.

BU'CRANE (Gk. *βουκράνιον*, *boukranion*, ox-head, from *βοῦς*, *bous*, ox + *κρανίον*, *kranion*, skull). A decoration consisting of an ox skull, usually carved on Greek or Roman altars as a traditional ornament, and connected often with festooned wreaths of flowers. This motive passed

from altars to friezes and other architectural details. Rams' heads and other animals' heads are often also called bucranes.

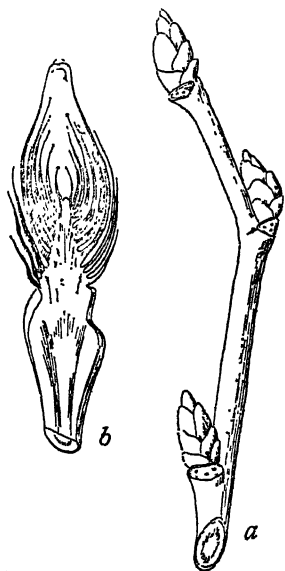
BUCUREȘTI. Rumanian name of Bucharest. **BUCYRUS.** A city and the county seat of Crawford Co., Ohio, 61 miles north of Columbus, on the Sandusky River, and on the Columbus, Sandusky, and Hocking, the Toledo and Ohio Central, the New York Central, and the Pennsylvania railroads (Map: Ohio, E 4). In the city are a park, fine county buildings, a public library, a hospital, the Sandusky River bridges, and municipal water works and reservoir. Bucyrus is in an agricultural and stock-raising region, with numerous mineral springs, and has railway shops and extensive manufactures of clay-working machinery, locomotive cranes, copper kettles, steam shovels, automobile and gas engines, ventilating and heating apparatus, office and school furniture, fans and blowers, plows, etc. Settled in 1818, Bucyrus was laid out as a village in 1822 and elected its first mayor in 1833. The government is administered under a charter of 1885, which provides for a mayor, elected biennially, and a city council. Pop., 1910, 8122; 1920, 10,425.

BUCZACZ, bôc'chäch. A town of the Austrian Crownland of Galicia, situated on the Strypa, a tributary to the Dniester, about 35 miles east-northeast of Stanislaus (Map: Austria, J 2). It has a handsome Rathaus and the ruins of an old castle. It is famous for its hardy breed of horses. The principal industries are agriculture, the manufacture of vinegar and potash, and tanning. In 1672 a treaty of peace was signed here between the Poles and the Turks, by which the former relinquished to the latter considerable territory. Pop., 1890, 11,096; 1900, 11,504; 1910, 13,334.

BUD (Late ME. *budde*, Dutch *bot*, probably under the influence of OF. *boton*, Fr. *bouton*, bud, button). An undeveloped shoot, in which the older leaves overlap and protect the younger leaves and the growing point of the axis. They may be considered under two heads, (1) leaf buds and (2) flower buds ("alabastra").

Leaf Buds. Among seed plants, leaf buds are distinguished as either terminal or lateral in position. The terminal bud, if developed, continues the axis, while the lateral bud gives rise to branches. For the most part, the lateral buds hold a definite position in reference to the leaves, the rule being that such a lateral bud is developed in the axil of each leaf. Of course in many cases there are leaves without such buds visible, or even formed in any way. Occasionally there are cases in which more buds than one appear in a single axil, a group of two, three, or more appearing, as in maples, certain willows, etc. These additional buds are spoken of as "accessory buds." There are also cases in which buds appear without any relation to the leaf, and such are known as "extra-axillary" buds. Again, buds may occur upon the older parts of stems and roots, or even on leaves, arising in this way out of their natural order of succession, and such are said to be "adventitious." In some cases buds are formed which do not develop further, and may even be overgrown by the outer layers of the plant body. Some condition, as a wound, may suddenly afford them opportunity to develop, and they are likely to be mistaken for adventitious buds. Such concealed or hidden buds are known as "latent" or "dormant" buds.

The terms just given have to do with the varying positions of buds. There is another set of terms based upon the presence or character of the overlapping leaves. In the "scaly buds," which are well known in connection with trees and shrubs of the temperate regions, the old overlapping leaves assume the form of more or less heavy and indurated scales, which serve well to protect the delicate structures within. The protection against moisture and sudden changes in temperature is often still further increased by a coating of some waxy or resinous substance, as in the horse-chestnut and balsam poplar. The scales are often also lined, and the delicate



Buds of horse-chestnut, in surface view (a) and in section (b).

leaves within covered with downy hairs. As distinct from the scaly buds there are also "naked buds," i.e., those in which there is no special organization of protecting scales, the ordinary leaves serving the purpose as far as necessary. There are also "fleshy buds," in which the investing leaves or scales become gorged with food substances forming the so-called "bulbs" (q.v.). Buds or budlike structures may not merely continue the growth of an axis or give rise to branches, but may also be used in propagation.

When they are definitely organized to be separated from the parent plant for this purpose, they are known as "brood buds." Brood buds are very commonly formed by mosses and ferns as well as by various groups of seed plants. The arrangement of the leaves in the leaf bud is called "vernation," a fanciful term given by Linnaeus to indicate that it is the spring condition of the plant. The term "præfoliation," which is a much better one, is sometimes used. Prominent among the terms of vernation are the following: "plicate" or "plaited," in which the young leaf is folded upon its ribs like a closed fan, as in the maple and currant; "conduplicate," in which the leaf is folded lengthwise on its midrib, as in the magnolia; "convolute," in which it is rolled from one margin to the other, as in the cherry; "involute," in which both margins are rolled towards the middle of the upper face, as in the violet; "circinate," in which the leaf is coiled from the apex downward, as in all true ferns.

Flower Buds. In flower buds the idea of protection is also evident, and the older overlapping leaves of an ordinary bud are represented functionally by the older overlapping sepals. In many cases, however, the sepals furnish no protection, and in some cases the necessary protection is provided by bracts, or leaves entirely outside of the structures of the flower. The arrangement of the members of the flowers in the

bud is called "æstivation," a term proposed by Linnaeus as indicating the summer condition of the plant. A much better term is "præfloration," but neither of them is of any special use at present. Certain arrangements of the sepals and the petals in the flower bud are of considerable value in classification, because they may be constant in plant groups. Prominent among these terms are the following: "valvate," in which the margins meet each other directly without any overlapping, as in the calyx of fuchsia; "imbricate," in which the parts overlap one another in the same manner as do the shingles of a roof, a condition well illustrated by the involucre of Compositæ; "convolute," in which the sepals or petals appear as if enwrapping one another and then twisted, as in gentians, polemoniums, etc.; "plicate" or "plaited," in which a tubular corolla or calyx is folded into narrow plaits overlapping one another, as in the common Jimson weed.

BUDÆUS, or BUDÉ, bu'dá', GUILLAUME (1467-1540). A French scholar, one of the greatest of his age. He was born in Paris and studied there and in Orleans. His works on philology, philosophy, and jurisprudence display extensive learning; the best known are *Annotationes in XXIV Libros Pandectarum* (1508), which opened a new era in the study of Roman law; *De Asse et Partibus Ejus* (1514), an investigation of ancient coins and measures, which in 200 years passed through 10 editions; and the *Commentarii Linguae Græcæ* (1519), lexicographical notes, dealing with the legal terminology of Greece and Rome, which greatly advanced the study of Greek literature in France. Budé's abilities were shown not only in literature, but in public business. Louis XII twice sent him to Rome as Ambassador, and Francis I also employed him in several negotiations. His fame as a Greek scholar was one of the glories of France. At Budé's suggestion Francis founded the Corporation of the Royal Readers, out of which sprang ultimately the Collège de France, and was also persuaded to refrain from prohibiting printing, which the Sorbonne had advised in 1533. At his suggestion, too, Francis founded the library at Fontainebleau, which, later transferred to Paris, was the basis of the Bibliothèque Nationale. Budé held several important offices—those of royal librarian, maître des requêtes, and provost of Paris. A collected edition of his works appeared at Basel in 1557. Budé was suspected of a leaning towards Calvinism. Certain circumstances render this highly probable, for in his correspondence with his friend Erasmus (q.v.) he repeatedly expressed his contempt for monks and ignorant ecclesiastics, and on one occasion termed the doctors of the Sorbonne "prating sophists." Besides, shortly after his death his widow and several members of his family moved to Geneva and openly abjured Catholicism. Consult: E. de Budé, *Vie de Guillaume Budé* (Paris, 1884); *Lettres inédites* (Paris, 1887); Sandys, *A History of Classical Scholarship*, vol. ii (Cambridge, 1908).

BUDAPEST, bu'dá-pést, Hung. pron. bõf-dõ-pësht (*Buda*, named after Buda, brother of Attila + *Pest*, from OSlav. *pešti*, Russ. *pechi*, oven, referring to its limekiln; *Ofen*, the German name of Buda, across the river, likewise means 'oven'). The capital of the Kingdom of Hungary, the transleithan portion of the Austro-Hungarian Monarchy, situated on both banks

of the Danube in lat. 47° 31' N. and long. 19° 5' E., about 130 miles direct, and 173 by rail, east-southeast of Vienna (Map: Hungary, F 3). It consists of the former cities of Buda (on the right bank) and Pest (on the left bank), which were united in 1872, together with Óbuda (Altöfen or Old Buda) and Kőbánya (Steinbruch), into the one municipality of Budapest. The city covers an area of 174 square kilometers (74.9 square miles), divided into 10 districts, viz.: Vár (Festung), Óbuda (Altöfen), and Viziváros (Wasserstadt) on the right bank, and, on the left bank, Belváros (Inner City), Terézváros (Theresienstadt), Lipótváros (Leopoldstadt), Erzsébetváros (Elisabethstadt), Józsefváros (Josefstadt), Ferencváros (Franzstadt), and Kőbánya (Steinbruch). The two banks of the Danube are connected by six bridges, including two railway bridges. The Kettenbrücke, erected 1842-49, by English engineers, is one of the largest suspension bridges in Europe, being 410 yards long and 39 feet broad. A second suspension bridge, the Schurplatz, completed in 1903, has a span of 317 yards and a breadth of 56 feet. The Margaret Bridge, an iron structure opened in 1876, is just below Margaret Island, to which a connecting bridge is extended. The Franz-Joseph Bridge was opened in 1896.

Buda, the more ancient and formerly the more important of the two divisions of the city, is the official (executive) centre of the city, while Pest not only constitutes the industrial and commercial part, but is the centre of the intellectual and nationalistic life. Buda is picturesquely situated on and around two hills—the lower and more northerly of the two crowned by a fortress, destroyed by the Hungarians in 1849 but rebuilt in even greater strength, and by the royal palace, erected (1748-71) by Maria Theresa. The palace, partly burned in 1849, was restored and greatly extended and beautified after 1894; its chapel contains the Hungarian regalia (the crown of St. Stephen, sceptre, orb, sword, and coronation robes). In Buda are the palatial buildings of the various ministries and several important schools, hospitals, and residences of Hungarian nobles. A little to the north of the ministries is the Matthias Church, the oldest in Budapest, begun in the thirteenth century and completed in the fifteenth century and restored in 1890-96; it served as a mosque during the Turkish occupation, and in it Franz Joseph and Elisabeth were crowned King and Queen of Hungary in 1867. The Blocksberg, standing to the south of the castle hill, is surmounted by a citadel. At the foot of these hills near the river are a number of strong sulphur springs, around which have been erected most commodious and luxurious bathing establishments. The famous bitter-water springs, such as the Hunyadi-János, Árpád, etc., are also situated here.

Pest presents a marked contrast to its neighbor on the opposite side of the river, being built upon a flat, sandy plain, and, although of more recent origin, it has far outstripped Buda in growth and general improvements. It presents to the river a long frontage of handsome buildings. The old town known as the inner city (*Belváros*) lies along the bank of the river and has been partially surrounded by an irregular semicircle of boulevards called *Die Innere Ringstrasse*, from which radiate several broad avenues connecting the old town with the new sub-

urbs. The finest of these is the broad Andrásy Strasse (*Andrássy-út*) extending in a straight line for a distance of nearly 2 miles from the inner ring to the park, or *Városliget* (*Stadt-wäldchen*). Because of its great breadth, varying from 100 to 150 feet, the excellence of its paving (wood), and the uniform merit of its architectural features, it well deserves the reputation of being one of the handsomest streets in Europe. About a mile out from the inner ring the radials are crossed by another semicircle of boulevards called *Die Grosse Ringstrasse*, extending from the Margaret Bridge to the Boráros Platz. Still others are planned for the future. One of the most striking features of Pest is the magnificent quays extending along the Danube for a distance of nearly 3 miles, from the Margaret Bridge to the huge municipal grain elevator, and lined with many handsome modern buildings. Traffic is excluded from certain sections which contain the fashionable cafés and form a favorite promenade. The most notable of the buildings found here are the magnificent new Houses of Parliament in the late Gothic style, covering an area of nearly four acres and opened with much pomp on the occasion of the Millennium celebration in 1896; they were begun in 1883 and not finally completed till 1902. Among others may be mentioned the Academy of Sciences (1862-64), in Renaissance style, containing a library of 150,000 volumes; the Palace of Prince Coburg; the so-called Redoute buildings, containing a concert hall, ballrooms, etc.; and the customhouse. In other parts of the town are the new Palace of Justice, erected in 1896; the courthouse of the Royal Supreme Court; the national museum (1836-44), containing a library of over 400,000 volumes and collections of antiquities, modern paintings, etc.; the university, with a library of over 250,000 volumes; the Múcsarnok, containing the Industrial Museum; the National Theatre; and several of the other numerous theatres. In the Andrásy-út are the Royal Opera House (1875-84), one of the handsomest in Europe, in the Italian Renaissance style, and the Museum of Fine Arts (1900-05), to which the national gallery was transferred in 1905 from the Academy of Sciences.

Among the notable ecclesiastical buildings are the parish church, the oldest in Pest, built about 1500; the Leopoldstadt Basilica (begun 1851), in Romanesque style, with a dome 315 feet high; the Romanesque Franzstadt Church (1874); two synagogues, built in 1861 and 1872, and a third synagogue, much larger than the others, begun in 1901; and the Greek Chapel. In respect of parks and recreation grounds Budapest has the *Stadtwäldchen* (*Városliget*), a park covering about 1000 acres, with a charming lake, zoölogical garden, and numerous booths and side shows, similar to those found in the Wurstel Prater in Vienna. At the entrance of the park at the end of the Andrásy boulevard is an artesian well over 3000 feet in depth, yielding over 260,000 gallons of water daily of a temperature of 165° F. Margaret Island, the property of Archduke Joseph, formerly the seat of a convent founded by St. Margaret in the thirteenth century, is now a park and is open to the public. Budapest is the seat of the highest administrative authorities of the kingdom, of the Supreme Court of Justice, of the Prince Primate of Hungary (alternately with Gran), of a Roman Catholic vicar-general, a bishop of the Greek-Oriental

church, and of a United States consulate general.

For administrative purposes Budapest is divided into 10 municipal districts (Bezirke), 3 of which are on the Buda side and the other 7 on the Pest side of the river. The city's affairs are administered by a first burgomaster appointed by the king, a burgomaster, two vice burgomasters, and an executive board of eight members, chosen for a term of six years by the municipal council of 400 members, who are themselves elected for the same term. Half of this number are chosen by the voters out of 1200 of the largest taxpayers, men of superior education being rated at double the capital on which they actually pay taxes, thus providing special opportunities for the university element to assert itself in the council. As a result of the general efficiency of the municipal authorities, as well as of the desire of the inhabitants to make Budapest one of the leading capitals of Europe, the changes and improvements introduced since the granting of the new Hungarian constitution in 1868 have been highly important. One of the first great problems which confronted the authorities was to provide better sanitary conditions for the city. A huge filtering plant was established for the treatment of the Danube water, which had hitherto been used unfiltered for drinking purposes; and the system of sewers was largely extended and improved, although refuse is still discharged into the river. The overcrowded dwellings of the poor and the damp cellars which sheltered a great part of the working people were found also to contribute largely to the high death rate. To remedy this, ordinances were passed prohibiting living in cellars, a great many of the crowded quarters were demolished, and in place of the one-story dwellings formerly so numerous, large airy tenements of from three to four stories have been erected. Budapest has become one of the handsomest cities of Europe.

At the head of Budapest's educational institutions is the university (see BUDAPEST, UNIVERSITY OF). Next follow the Academy of Sciences, for the fostering of the Magyar language and the sciences; the Royal Polytechnic; the Royal Veterinary College; the Roman Catholic and Reformed seminaries, and the Military Academy (Ludovica). There are some 10 gymnasia, a number of high schools, over 30 upper grammar schools, and more than 160 elementary schools, in which both Hungarian and German are taught. In addition to these there are numerous mercantile and trade schools, music and art schools, and educational institutions for the blind and for the deaf and dumb. The charitable institutions include a large general municipal hospital, two belonging to the Red Cross Society, two military hospitals, and a number of others run by various charitable organizations, several lunatic asylums, a blind asylum, two orphan asylums, and two poor-houses.

Perhaps the most important branch of industry is the production of flour and bran in the model mills, which have made Budapest one of the greatest milling centres in the world. In connection with this industry the municipality built a huge grain elevator on the Danube quay, for the purpose of demonstrating the modern methods of handling grain. The manufactures have developed into great prominence and embrace a wide variety of articles. Among the

more important are machinery, agricultural implements, carriages, cutlery, glass, majolica, porcelain, metal and leather wares, musical and scientific instruments, starch, cement, liquors, and beer. There are also a large government firearms factory, three government tobacco factories, and shipbuilding yards. Budapest is not only the largest industrial centre of Hungary, but contains the greater part of its modern large industrial establishments. The number of stock companies doing business in the city increased from 42 in 1889 to 268 in 1902, and their capital from \$18,000,000 in the former year to \$160,000,000 in the latter. The trade is of perhaps greater importance than the manufactures, the chief articles of commerce being grain, wine, alcohol, tobacco, hemp, honey, wax, hides, feathers, cattle, sheep, and swine. The commercial importance of Budapest is materially increased by the fact that it is the central point of all the Hungarian railways, and in consequence the greater part of the agricultural produce is exported by way of the capital. The Danube also plays a prominent part in its commercial activity, as most of the grain is brought from the interior in huge barges, often having a capacity of over 600 tons, by way of this great waterway and its tributaries. As regards its street-railway facilities, Budapest compares favorably with any of the great capitals. It bears the distinction of being the first city successfully to demonstrate the entire practicability of the electric underground trolley system. The first line was opened in 1889 and has proved entirely satisfactory from both a mechanical and a financial standpoint. An electric underground road opened in 1896 extends from the Gisela-platz near the river to the Stadtwaldchen; numerous overhead trolley lines and steam tramways connect the capital with its suburbs and neighboring towns, while the various hills on the Buda side of the river are ascended by cable or cog roads. Most of these lines were built and operated by private companies, but at the expiration of their charters become the property of the city.

In population few cities of Europe increased so rapidly as Budapest, and particularly Pest, during the nineteenth century. The joint population in 1799 is stated to have been 54,179, of which about 30,000 belonged to Pest, whose population for the first time exceeded that of Buda. Thereafter Pest grew much more rapidly than Buda. The total number of inhabitants had increased to 60,259 in 1810 and 107,240 in 1841. A most remarkable growth, together with a thorough transformation of the city, is to be noted since 1867. The civil population of Budapest has been returned as follows: 1869, 270,685; 1880, 360,551; 1890, 491,938; 1900, 716,476; 1910 (census of December 31), 863,735. The total de facto population in 1910 (including 16,636 military) was 880,371. Of the civil population in 1910, 433,604 were males, and 446,767 females; foreigners numbered 44,102. Of the total population in 1910, Magyar was the mother tongue of 756,070; German, 78,882; Slovak, 20,359; Servian, 3972; Croatian, 2796; Rumanian, 2777. Of the total, Roman Catholics numbered 526,175; Greek Catholics, 9428; Reformed, 86,990; Evangelicals (Augsburg Confession), 43,562; Greek Orthodox, 6962; Unitarians, 2120; Jews, 203,687 (over 23 per cent of the total); others, 1447. Persons able to read and write, 739,297.

History. It is known that in the second century Buda was the site of a Roman camp, Aquincum. Pest is first heard of in the thirteenth century, when it appears as a populous town inhabited mainly by Germans. In 1444 Matthias Corvinus fortified Buda and made it the capital of the country, and by his patronage of learning made it one of the noted centres of the Renaissance, but the citadel fell into the hands of the Turks after the battle of Mohács in 1526 and from 1541 remained continuously in their possession till 1686. During this period of 160 years it stood six sieges, while the town of Pest was almost completely destroyed. Re-occupied by the Hapsburgs in 1686, Buda became a free Imperial city, was especially favored by Maria Theresa and Joseph II, and has prospered wonderfully in spite of a disastrous inundation which wiped out a large part of the town in 1838. On May 21, 1848, after a heroic defense by Hentzi, the citadel of Buda was stormed by the Hungarians under Görgei, and Pest was for a brief time the capital of the revolutionary government. After the *Ausgleich* of 1867 Pest became the capital of the Hungarian Kingdom. In 1873 Buda and Pest were united.

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BUDAPEST, UNIVERSITY OF. The Royal Hungarian university, which has followed the varied fortunes of its native land. A university was established at Budapest in 1389-90 by King Sigismund on an older foundation. This disappeared in the next century, and another was founded at the end of the fifteenth century by King Matthias, which was in turn destroyed by the Turkish invasions of the sixteenth century. In 1635 a national university was founded by Archbishop Cardinal Peter of Pázmány at Tyrnau, partly under Jesuit control. At the fall of the Jesuits this institution obtained some of their property. In 1769-70 Maria Theresa finally established the national university on a firm basis. In 1777 it was removed to Buda and in 1783 to Pest, where in 1786 a building was given it by Joseph II. It was reorganized in 1850 on the Austrian model, but has since come entirely under Hungarian influences. It had in 1912 over 7500 students. Its faculties include theology, law and the social sciences, medicine, and philosophy. Its library was founded in 1635 and contains over 485,000 volumes and some 3500 manuscripts.

BUDASBERG. See BÜDÖS-HEGY.

BUDAUN, by-doun'. A town of India, 140 miles northwest of Lucknow, giving its name to a British district of the Rohilkhand division of the United Provinces (Map: India, C 3). It is situated in lat. 28° 27' N. and long. 79° 11' E. An American Methodist mission maintains sev-

eral schools for girls in the district. Pop., 1901, 39,031; 1911, 38,230.

BUDD, JOSEPH LANCASTER (1835-1904). An American horticulturist, born at Peekskill, N. Y. In 1901 he occupied the chair of horticulture and forestry in the Iowa Agricultural College. He introduced many specimens of fruit and ornamental trees indigenous to Russia into the United States and contributed greatly to the arboriculture and horticulture of the Northwest. He published *American Horticultural Manual* (2 vols., 1902-03).

BUDDE, böd'de, KARL FERDINAND REINHARD (1850-). A German theologian, born at Bensberg. He was inspector of the Evangelisches Theologisches Stift at Bonn from 1878 to 1885, professor at Bonn in 1879, at Strassburg in 1889, and in 1900 was made professor of Old Testament exegesis and the Hebrew language at Marburg. He received a D.D. from St. Andrews in 1911. He wrote: *Die Bücher Richter und Samuel, ihr Aufbau und ihre Quellen* (1890); "The Religion of Israel to the Exile," in *American Lectures on the History of Religions* (1899); *Die Bücher Samuel* (1902); *Die alte Testamente und die Ausgrabungen* (1903); *Das prophetische Schriftum* (1905); *Geschichte der althebräischen Litteratur* (1906); *Auf dem Wege zu Monotheismus* (1910).

BUDDHA, böd'dä. See GAUTAMA BUDDHA.

BUDDHISM, böd'diz'm. The religion known as Buddhism, from the title of "The Buddha" (meaning in Sanskrit 'the wise, the enlightened'), acquired by its founder, has existed now for nearly 25 centuries, and is, next to Christianity, the most extended religion of the world; but in this estimate all the Chinese and Japanese are classed as Buddhists. In Hindustan, the land of its birth, it has now little hold, except among some of the northern tribes; but it bears full sway in Ceylon, Nepal, and over the whole Indo-Chinese Peninsula. It shares the adherence of the Chinese with the systems of Confucius and Lao-tse, claiming perhaps two-thirds of the population. It prevails also in Japan, although not the established religion; and north of the Himalayas it is the religion of Tibet (where it assumes the form of Lamaism) and of the Mongolian population of Central Asia, and extends to the very north of Siberia and even into Lapland. Its adherents are estimated at 500,000,000, but this figure is hardly more than a guess. Yet, until near the middle of the nineteenth century, nothing was known in Europe respecting the nature and origin of this world religion beyond the vaguest notices and conjectures. About the year 1824 B. H. Hodgson, British Resident at the court of Nepal, where Buddhism prevails, discovered the existence of a large set of writings in Sanskrit language, forming the national canonical books. These books have since been found to be texts from which the Buddhist scriptures of Tibet, Mongolia, and China, must have been translated. The books of the Ceylon Buddhists, which were discovered by G. Turnour, are in the language called Pāli. They are not translations of the Nepalese standards, though they are found to agree with them in some particulars. Most scholars now think that the Pāli canon is older and more authoritative than the Sanskrit (Northern) canon. Translations from the Ceylon standards are used by the Buddhists of Burma and Siam. Tibetan and Chinese translations were made from a Sanskrit canon which

was lost, but portions of it were rediscovered by Grünwedel in Chinese Turkestan. It follows closely the Pāli canon, although its form is more succinct. Copies of the Sanskrit books of Nepal were sent by Hodgson to the Asiatic societies of London and Paris, and they engaged the attention of the eminent Oriental scholar Eugene Burnouf (q.v.), who published in 1844 his *Introduction to the History of Buddhism*; and this book may be said to have been the beginning of correct information on the subject among the Western nations.

The most diverse opinions had previously prevailed as to the time and place of the origin of Buddhism. Some looked upon it as a relic of what had been the original religion of Hindustan, before Brahmanism intruded and drove it out; a relic of a widespread primeval worship, whose ramifications it was endeavored to trace by identifying Buddha with the Woden of the Scandinavians, with the Thoth or Hermes of the ancient Egyptians, and with other mythological personages. Others held that it could not be older than Christianity and must have originated in a blundering attempt to copy that religion, so striking are the many points of resemblance that present themselves. Although the means are still wanting of giving a circumstantial history of Buddhism, the main outline is no longer doubtful. Most Oriental scholars now fix the date of its origin about the middle of the sixth century B.C., and all agree that it arose in the north of Hindustan. According to the Buddhist books, the founder of the religion was a prince of the name of Siddhārtha, son of Sudhodana, the petty Rāja of Kapilavastu, on the southern border of the District of Nepal. He is often called Sakya, which was the name of the family, and also Gautama. The name Sakya often becomes Sakya-muni (*muni*, in Sanskrit, means 'solitary'), in allusion to the solitary habits assumed by the prince. To Gautama is frequently prefixed *Sramana*, meaning 'ascetic.' Of the names, or rather titles, given to Siddhārtha in his state of perfection, the most important is the *Buddha*,* which is from the root *budh*, 'to know,' and means 'enlightened' or 'he to whom truth is known'; it is indicative of the leading doctrine of his system. Other attributes are "the blessed" (*Bhagavat*); "the venerable of the world"; "the Bodhisat," the import of which will be afterward explained. The history of this person is overlaid with a mass of extravagant and incredible legend, and the eminent Orientalist Senart thought it doubtful whether the legendary Buddha was an actual historical personage and not rather an allegorical figure. But by Oriental authorities generally the Buddha is received as the actual personal founder of the religion that goes by his name.

Assuming that the Buddha was a real person, and that there is a basis of fact under the mass of extravagant fable with which he is surrounded, the history of Buddhism may be thus briefly outlined: The prince Siddhārtha gives early indications of a contemplative, ascetic disposition; and his father, fearing lest he should desert his high station as Kshatriya (see CASTE) and ruler and

take to a religious life, has him early married to a charming princess and surrounded with all the splendor and dissipation of a luxurious court. Twelve years spent in this environment only deepen the conviction that all that life can offer is vanity and vexation of spirit. He is constantly brooding over the thought that old age, withered and joyless, is fast approaching; that loathsome or racking sickness may at any moment seize him; that death will at all events soon cut off all present sources of enjoyment and usher in a new cycle of unknown trials and sufferings. These images hang like Damocles' sword over every proposed feast of pleasure and make enjoyment impossible. He therefore resolves to try whether a life of austerity will not lead to peace; and, although his father seeks to detain him by setting guards on every outlet of the palace, he escapes, and begins the life of a religious mendicant, being now 29 years old. To mark his breaking off all secular ties, he cuts off the long locks that were a sign of his high caste; and as the shortened hair turned upward, he is always represented in figures with curly hair, which induced early European writers to consider him as of Ethiopian origin. He commences by studying all that the Brahmins can teach him, but he finds their doctrine unsatisfactory. Six years of rigorous asceticism are equally vain; and resolving to return to a more genial life, he is deserted by five disciples, who had been attracted to him. At this time he triumphantly withstands the temptation by the demon Māra. But no discouragement or opposition can divert Sakya-muni from the search after deliverance. He will conquer the secret by sheer force of thinking. He sits for weeks plunged in abstraction, revolving the causes of things. If we were not born, he reflects, we should not be subject to old age, misery, and death; therefore the cause of these evils is birth. But whence comes birth or continued existence? Through a long concatenation of intermediate causes he arrives at the conclusion that ignorance is the ultimate cause of existence; and therefore, with the removal of ignorance, re-birth, and all its consequent anxieties and miseries, would be cut off at their source. Passing through successive stages of contemplation, he realizes this in his own person and attains the perfect wisdom of the Buddha. The scene of this final triumph received the name of Bodhimanda ('the seat of intelligence'), and the tree under which he sat was called Bodhidruma ('the tree of intelligence'), whence *bo tree*. (See *BO TREE*.) The Buddhists believe the spot to be the centre of the earth. Twelve hundred years after the Buddha's death, Hiouen-Thsang, the Chinese pilgrim, found the Bodhidruma—or a tree that passed for it—still standing. There are, about 5 miles from Gaya (near Patna), extensive ruins and a temple, which are believed to mark the place. Behind the temple there flourished, in 1812, a peepul tree, apparently 100 years old, which may have been planted in the place of the original *bo tree*. A young tree now stands in its place. The temple is restored and a Buddhist monastery has been built near by, and it remains as the only home of the faith in India proper.

Having arrived at the knowledge of the causes of misery and of the means by which these causes are to be counteracted, the Buddha was now ready to lead others on the road to salvation. It was at Benares that he first preached,

* There is a confusing variety in the modes in which this name is spelled by European writers. S. Hardy, in his *Manual of Buddhism*, gives more than 50 forms that have come under his notice. Some of the more common are Bud, Bod, But, Budh, Boodh, Bhod, Budo, Buddow, Boutta, Poota, Poth, Pot. The Chinese, owing to the meagreness of their articulations, seem to have been unable to come nearer to the real sound than Fo, Foe, or Fohi; from the same cause, they convert Brahma into Fan.

or, in the consecrated phrase, "turned the wheel of the law";* but the most important of his early converts was Bimbisara, the sovereign of Magadha (Behar), whose dynasty continued for many centuries to patronize the new faith. During the 44 years that he continued to preach his gospel he appears to have traversed a great part of northern India, combating the Brahmans and everywhere making numerous converts. He died at Kusinagara (in Oude) at the age of 80, probably in the year 477 B.C.; and his body being burned, the relics were distributed among a number of contending claimants, and monumental tumuli were erected to preserve them. See *TOPE*.

The most important point in the history of Buddhism, after the death of its founder, is that of the three councils, which are said to have fixed the canon of the sacred scriptures and the discipline of the church. The Buddha had composed no work himself, but his chief followers assembled in council immediately after his death and proceeded to reduce his teaching to a canon. These canonical works are divided into three classes, forming the Tripiṭaka (Pāli, *Tipiṭaka*), or 'triple basket.' The first class consists of the *vinaya*, or discipline; the second contains the *sūtras* (Pāli, *Suttapiṭaka*), or discourses; and the third the *abhidharma* (Pāli, *Abhidhammapiṭaka*), or psychology. The other two councils are said to have further settled the canon and revised the belief of the church. It is, however, exceedingly doubtful whether the first council had such a character as tradition assigns to it, and the very existence of the second council is doubted by competent scholars. It seems probable that the first council set down, in Māgadhi Sanskrit, the *vinaya* and the *sūtra*, although not in the form in which they have come down to us. The second council, which was mainly of local importance, is said to have been held at Vesālī, 100 years after Buddha's death; the third was held in Pātaliputra, under the auspices of King Piyadasi Asoka, in 246 B.C. Still another was held, under King Kanishka, between 76 and 100 A.D. At precisely what date the Pāli canon as we have it was fixed is still uncertain, but probably it was in the main what it is now as early as the third century B.C. The canon was not reduced to writing till the first century B.C. Besides the Tripiṭaka referred to above, the canon of the Great Vehicle (*Mahāyāna*) contains two special works, dating not certainly earlier than the times of Kanishka, and of the first century A.D. These are "The Lotus of the Good Law," and the *Lalitā Vistara*, the latter of which contains the life of Buddha. To these may be added the *Mahāvastu*, which belongs to the second century B.C. All the northern Buddhists recognize these books as authoritative. The *Buddhacarita*, the earliest life of Buddha, dates from the first century A.D. (See *ASVAGHOSHA*.) The Buddhist religion early manifested a zealous missionary spirit, and princes and even princesses became devoted propagandists. A prince of the royal house of Magadha, Mahindo, carried the faith to Ceylon, 307 B.C. The Chinese annals speak of a Buddhist missionary as early

as 217 B.C.; and the doctrine made such progress that in 65 A.D. it was acknowledged by the Chinese Emperor as a third state religion. The Chinese Buddhists have always looked on India as their "holy land," and, beginning with the fourth century of our era, a stream of Buddhist pilgrims continued to flow from China to India during six centuries. Several of these pilgrims have left accounts of their travels, which throw a light on the course of Buddhism in India, and on the internal state of the country in general, that is looked for in vain in the literature of India itself. See *HIUEN-TSANG*.

A prominent name in the history of Buddhism is that of Asoka, King of Magadha in the third century B.C., whose sway seems to have extended over the whole peninsula of Hindustan and even over Ceylon. (See *ASOKA*.) This prince was to Buddhism what Constantine was to Christianity. He was at first a persecutor of the faith, but being converted—by a miracle, according to the legend—he became a zealous propagator of the religion—not, however, as princes usually promote their creed, for it is a distinguishing characteristic of Buddhism that it has never employed force, rarely even to resist aggression. Asoka showed his zeal by building and endowing viharas or monasteries and raising topes and other monuments over the relics of Buddha, and in spots remarkable as the scenes of his labors. Hiuén-Tsang, in the seventh century of our era, found topes attributed to Asoka from the foot of the Hindu Kush to the extremity of the peninsula. There exist, also, in different parts of India, edicts inscribed on rocks and pillars inculcating the doctrines of Buddha. The edicts are in the name of King Piyadasi.

Not a single building or sculptured stone has been discovered in continental India of earlier date than the reign of this monarch. A remarkable spirit of charity and toleration runs through these royal sermons. The "king beloved of the gods" desires to see the ascetics of all creeds living in all places, for they all teach the essential rules of conduct. "A man ought to honor his own faith only; but he should never abuse the faith of others. . . . There are even circumstances where the religion of others ought to be honored, and in acting thus a man fortifies his own faith and assists the faith of others."

For the glimpses we get of the state of Buddhism in India we are indebted chiefly to the accounts of Chinese pilgrims. Fa-hian, at the end of the fourth century, found some appearances of decline in the east of Hindustan, its birthplace, but it was still strong in the Punjab and the north. In Ceylon it was flourishing in full vigor, the ascetics or monks numbering from 50,000 to 60,000. In the seventh century—i.e., 1200 years after the death of the Buddha—Hiuén-Tsang represents it as dominant but decaying though patronized by powerful rājas.

During the first four or five centuries of our era, and in some instances much earlier, Buddhists, perhaps driven from the great cities, retired among the hills of the west, and there constructed those cave temples which, for their number, vastness, and elaborate structure, continue to excite the wonder of all who see them. There are reckoned to be not fewer than 900 Buddhist excavations still extant in India, nearly all within the presidency of Bombay. How the destruction of the Buddhist faith in Hindustan came about—whether from internal corruption,

* From a too literal understanding of a metaphor have arisen, probably, those praying-wheels, or rather wheels for meditation, seen standing before Buddhist monasteries in Tibet and elsewhere. The doctrines of Buddha are inscribed on the wheel, which is then set in motion by a windlass, or even by horse power. The individual monks have portable ones, with which they perform their devotions wherever they may happen to be.

or the persecution of powerful princes, adherents of the old faith—we do not know. But it is certain that from the time of Hiouen-Tsang's visit its decay must have been rapid beyond precedent, for about the eleventh or twelfth century the last traces of it disappear from the Indian Peninsula.

What, then, is the nature of this faith, which has been for so long, and is still, the sole light of many millions of human beings? In answering this question we must confine ourselves here to a brief outline of the intellectual theory on which the system is based, and of the general character of its morality and ritual observances, as they were conceived by the founder and his more immediate followers; referring for the various forms which the external observances have assumed to the several countries where it is believed and practiced. See BURMA; CEYLON; CHINA; JAPAN; LAMAISM.

Buddhism accepts without questioning the doctrine of transmigration, which lies at the root of so much that is strange in the eastern character. For a particular account of this important doctrine or notion, without a knowledge of which no phase of thought or feeling among the Hindus can be understood, the reader is referred to METEMPSYCHOSIS; while the peculiar cosmogony or system of the universe with which it is associated, and which is substantially the same among Hindus and Buddhists, will be described under INDIA. It is sufficient here to say that, according to Buddhist belief, when a man dies he is immediately born again, or appears in a new shape; and that shape may, according to his merit or demerit, be any of the innumerable orders of being that compose the Buddhist universe—from a clod to a divinity. If his demerit would not be sufficiently punished by a degraded earthly existence—in the form, for instance, of a woman or a slave, of a persecuted or a disgusting animal—he will be born in some one of the 136 Buddhist hells, situated in the interior of the earth. These places of punishment have a regular gradation in the intensity of the suffering and in the length of time the sufferers live, the least term of life being 10,000,000 of years, the longer terms being almost beyond the powers of even Indian notation to express. A meritorious life, on the other hand, secures the next birth either in an exalted and happy position on earth, or as a blessed spirit, or even divinity, in one of the many heavens, in which the least duration of life is about ten billions of years. But however long the life, whether of misery or of bliss, it has an end, and at its close the individual must be born again, and may again be either happy or miserable—either a god or, it may be, the vilest inanimate object.* This doctrine does not imply a continuation of personality after death, as the new births do not bring along the memory of the past lives. Furthermore the very existence of the soul is denied by the Buddhists. What is inherited is the predisposition, or instinct (*samskāra*), for the actions committed during one of these births leave indelible traces which are certain to come to light during the subsequent lives. The Buddha

himself, before his last birth as Sakya-muni, had gone through every conceivable form of existence on the earth, in the air, and in the water, in hell and in heaven, and had filled every condition in human life. When he attained the perfect knowledge of the Buddha, he was able to recall all these existences; and a greater part of the Buddhist legendary literature (the *Jātakas*, or 'birth stories') is taken up in narrating his exploits when he lived as an elephant, as a bird, as a stag, and so forth.

The Buddhist conception of the way in which the quality of actions—which is expressed in Sanskrit by the word *karma*, including both merit and demerit—determines the future condition of all sentient beings, is peculiar. They do not conceive any god or gods as being pleased or displeased by the actions, and as assigning the actors their future condition by way of punishment or of reward. The very idea of a god, as creating or in any way ruling the world, is utterly absent in the Buddhist system. God is not so much as denied; he is simply not known. Contrary to the opinion once confidently and generally held, that a nation of atheists never existed, it is no longer to be disputed that the numerous Buddhist nations are essentially atheist; for they know no beings with greater supernatural power than any man is supposed capable of attaining to by virtue, austerity, and science. The future condition of the Buddhist, then, is not assigned him by the Ruler of the Universe; the "karma" of his actions determines it by a sort of virtue inherent in the nature of things—by the blind and unconscious concatenation of cause and effect. But the laws by which consequences are regulated seem dark and even capricious. A bad action may lie dormant, as it were, for many existences; the taint, however, is there, and it will some time or other break out. A Buddhist is thus never at a loss to account for any calamity that may befall himself or others.

Another basis of Buddhism is the assumption that human existence is on the whole miserable, and a curse rather than a blessing. An enervating climate and political conditions may have aided in producing the feeling common to Brahman and Buddhist that life is evil. But the root of the matter is philosophical. Life is a whole; nature is a whole; to be born is to become separate or individualized from the whole. Individuality implies limitation; limitation implies error; error implies ignorance. Hence birth is an evil because it is inseparable from ignorance, and it is only the removal of ignorance which can lead to the suppression of desire, while only the suppression of desire can lead to peace. This desire, which Buddha identified with the "will to live," he called *Trishnā* (Pāli *Taṇhā*) or 'thirst.' The little value that Hindus set upon their lives is manifested in many ways. The punishment of death, again, has little or no terror for them and is even sometimes coveted as an honor.

In the eyes, then, of Sakya-muni and his followers, sentient existence was hopelessly miserable. Misery was not a mere taint in it, the removal of which would make it happy—misery was its very essence. Death was no escape from this inevitable lot, for, according to the doctrine of transmigration, death was only a passage into some other form of existence equally doomed. Even the heaven and the state of godhead, which form part of the cycle of chances in this system, were not final; and this thought

* According to one legend the Bhagavat, in order to impress upon the monks of a monastery the importance of their duties, pointed to a besom, and, by his supernatural insight, he revealed to them that it had once been a novice who had been negligent in sweeping the hall of assembly. The walls and pillars, again, he told them, had once existed as monks, who soiled the walls of the hall by spitting upon them.

poisoned what happiness they might be capable of yielding. Brahman philosophers had sought escape from this endless cycle of unsatisfying changes by making the individual soul be absorbed in the universal spirit (Brahman); Gautama had the same object in view, viz., exemption from being born again; but he had not the same means of reaching it. He recognized no soul, and his philosophy was utterly atheistic. Gautama sees no escape but in what he calls Nirvāna (Pāli, *Nibbāna*), literally 'extinction,' 'blowing out,' of desire; but most Orientalists are agreed that in the Buddhist scriptures generally it is equivalent to annihilation. A distinction, however, must be made between the "Nirvāna during life" analogous to the Jivānmukti or "enlightenment during life" of the Brahmins, and the complete Nirvāna (*Parinirvāna*) which is consequent upon the former when the "enlightened" individual comes to death. Yet it would be wrong to hold that the man who has freed himself from desire and has recognized the essentially illusory character of this world is utterly devoid of sentiment; on the contrary, the Buddha and his followers lay stress on Love, which is the cardinal virtue of Buddhism. While, in his perfect peace of mind, the "enlightened" man is entirely indifferent to pleasure and pain and unmoved by the vicissitudes of this world, his soul is not dead, but filled with love and sympathy for everything which is still in the thrall of desire, but without undue preference of one object over another. This love, or charity, is called in Sanskrit *Maitrī* (Pāli, *Mettā*). The Buddhist expects a future Buddha, more perfect than the founder of Buddhism, who shall be all-love (*Metteyya*). See NIRVANA.

The key of the whole scheme of Buddhist salvation lies in what Gautama called his four sublime verities. The first asserts that pain exists; the second, that the cause of pain is desire or attachment—the meaning of which will appear further on; the third, that pain can be ended by suppressing desire; and the fourth shows the way that leads to this. This way consists in eight things: right faith, right judgment, right language, right purpose, right practice, right effort, right thinking, and right meditation. In order to understand how this method is to lead to the proposed end, we must turn to the metaphysical part of the system contained in the "concatenation of causes," or "chain of causation" (*Pratityasamutpāda*), which may be looked upon as a development of the second "verity," viz., that the cause of pain is desire (*Trṣṇā*)—or rather, as the analysis upon which that verity is founded. The immediate cause of pain is birth, for if we were not born we should not be exposed to death or any of the ills of life. Birth, again, is caused by previous existence; it is only a transition from one state of existence into another. All the actions and affections of a being throughout his migrations leave their impressions, stains, attachments, adhering to him, and the accumulation of these determines at each stage the peculiar modification of existence he must next assume. This is the only soul that Buddha recognizes. These adhesions or attachments, good and bad, depend upon desire. We thus arrive at desire—including both the desire to possess and the desire to avoid—as one link in the chain of causes of continued existence and pain. Beyond this the dependence of the links is very

difficult to trace; for desire is said to be caused by perception, perception by contact, and so on, until we come to ideas. Ideas, however, are mere illusions, the results of ignorance or error, attributing durability and reality to that which is transitory and imaginary. Cut off this ignorance, bring the mind into a state in which it can see and feel the illusory nature of things, and forthwith the whole train vanishes; illusory ideas, distinction of forms, senses, contact, perception, desire, attachment, existence, birth, misery, old age, death!

Morality and Religious Observances.—The eight parts or particulars constituting the theoretical "middle way" to Nirvāna (i.e., the way which lies between the two extremes of sensual gratification and asceticism) were developed by Gautama into a set of practical precepts enjoining the various duties of common life and of religion. They are all ostensibly intended as means of counteracting or destroying the chain of causes that tie men to existence and necessitate being born again, especially that most important link in the chain constituted by the attachments or desires resulting from former actions; although the special fitness of some of the precepts for that end is far from being apparent. In delivering his precepts, the Buddha considers men as divided into two classes—those who have embraced the religious life (*Sramanas*), and those who continue in the world, or are laymen. These last are considered as too much attached to existence to feel any desire or have any hope of emancipation—at least at this stage. But there are certain precepts which it is necessary for all to obey that they may not bring greater misery upon themselves in their next births and rivet the bonds of existence more indissolubly. There are ten moral precepts or "precepts of aversion." Five of these are of universal obligation—viz., not to kill, not to steal, not to commit adultery, not to lie, not to be drunken. The other five are for those entering on the direct pursuit of Nirvāna by embracing the religious life: to abstain from food out of season, i.e., after midday; to abstain from dances, theatrical representations, songs, and music; to abstain from personal ornaments and perfumes; to abstain from a lofty and luxurious couch; to abstain from taking gold and silver. For the regular ascetics, or monks, there are a number of special observances of a very severe kind. They are to dress only in rags, sewed together with their own hands, and to have a yellow cloak thrown over their rags. They are to eat only the simplest food and to possess nothing except what they get by collecting alms from door to door in their wooden bowls. They are allowed only one meal, and that must be eaten before midday. For a part of the year they are to live in forests, with no other shelter except the shadow of a tree, and there they must sit on their carpet even during sleep, to lie down being forbidden. They are allowed to enter the nearest village or town to beg food, but they must return to their forests before night.

Besides the absolutely necessary "aversions and observances" above mentioned, the transgression of which must lead to misery in the next existence, there are certain virtues or "perfections" of a supererogatory or transcendent kind that tend directly to "conduct to the other shore" (Nirvāna). The most essential of these are almsgiving or charity, purity, patience, courage, contemplation, and knowledge. Charity or

benevolence may be said to be the characteristic virtue of Buddhism—a charity boundless in its self-abnegation and extending to every sentient being. The benevolent actions done by the Buddha himself, in the course of his many millions of migrations, were favorite themes of his followers. On one occasion, seeing a tigress starved and unable to feed her cubs, he hesitated not to make his body an oblation to charity and allowed them to devour him. Benevolence to animals, with that tendency to exaggerate a right principle so characteristic of the East, is carried among the Buddhist monks to the length of avoiding the destruction of fleas and the most noxious vermin, which they remove from their persons with all tenderness. The sect of the Jains carried this to absurd extremes.

There are other virtues of a secondary kind, though still highly commendable. Thus, not content with forbidding lying, the Buddha strictly enjoins the avoidance of all offensive and gross language, and of saying or repeating anything than can set others at enmity among themselves; it is a duty, on the contrary, especially for a Sramana, to act on all occasions as a peacemaker. Patience under injury and resignation in misfortune are strongly inculcated. Humility, again, holds a no less prominent place among Buddhist graces than it does among the Christian. The Buddhist saints are to conceal their good works and display their faults. As the outward expression of this sentiment of humility, Gautama instituted the practice of confession. Twice a month, at the new and at the full moon, the monks confessed their faults aloud before the assembly. This humiliation and repentance seems the only means of expiating sin that was known to Gautama. Confession was exacted of all believers, only not so frequently as of the monks. The edicts of Piyadasi recommend a general and public confession at least once in five years. The practice of public confession would seem to have died out by the time of Hiouen-Thsang's visit to India.

Such are the leading features of the moral code of the Buddha, of which it has been said that "for pureness, excellence, and wisdom, it is only second to that of the Divine Lawgiver himself." But the original morality of Buddhism has, in the course of time, been disfigured by many subtleties, puerilities, and extravagances, derived from the casuistry of the various schools of later times. The theory on which the Buddha founds his whole system gives, it must be confessed, only too much scope to such perversions; for, on that theory, truth is to be spoken, self to be sacrificed, benevolence to be exercised, not for the sake of the good thus done to others, but solely for the effect of this conduct on the individual himself, in preparing him for escape from existence. To teach men "the means of arriving at the other shore" was another expression for teaching virtue; and that other shore was annihilation. On this principle the Buddhist casuist can, like the Jewish, render of no effect the universal law of charity and the duty of respecting and aiding parents, on which the Buddha laid such stress. Thus, a Bhikshu, or Bhikku—i.e., one who has engaged to lead a life of self-denial, celibacy, and mendicancy, and is thus on the high road to Nirvāna—is forbidden to look at or converse with a female, lest any disturbing emotion should ruffle the serene indifference of his soul; and so important is this that "if his mother have fallen into a

river, and be drowning, he shall not give her his hand to help her out; if there be a pole at hand, he may reach that to her; but if not, she must drown." (Wilson.)

Contemplation and science or knowledge (i.e., of the concatenation of causes and effects) are ranked as virtues in Buddhism and hold a prominent place among the means of attaining Nirvāna. It is reserved, in fact, for abstract contemplation to effect the final steps of the deliverance. Thought is the highest faculty of man and, in the mind of an Eastern philosopher, the mightiest of all forces. A king who had become a convert to Buddhism is represented as seating himself with his legs crossed and his mind collected; and "cleaving with the thunderbolt of science the mountain of ignorance," he saw before him the desired state. It is in this cross-legged, contemplative position that the Buddha is almost always represented—that crowning intellectual act of his, when, seated under the bo tree (q.v.), he attained the full knowledge of the Buddha, saw the illusory nature of all things, broke the last bonds that tied him to existence, and stood delivered for evermore from the necessity of being born again, being considered the culmination of his character and the highest object of imitation to all his followers.

"Complete" Nirvāna, or extinction of desires, which, in the original meaning of the term, is attainable during life, was, in fact, attained by Gautama himself. The process by which the state is attained is called *Dhyāna* and is neither more nor less than ecstasy or trance, which plays so important a part among mystics of all religions. The individual is described as losing one feeling after another, until perfect apathy is attained, and he reaches a state "where there are neither ideas, nor the idea of the absence of ideas!"

The *ritual* or *worship* of early Buddhism—if worship it can be called—is very simple in its character. There are no priests, or clergy, properly so called. The *Sramanas* or *Bhikshus* (mendicants) are simply a religious order—a class of monks, who, in order to accomplish the more speedy attainment of Nirvāna, have entered on a course of greater sanctity and austerity than ordinary men; they have no sacraments to administer nor rites to perform for the people, for every Buddhist is his own priest. The only thing like a clerical function they discharge is to read the scriptures or discourses of the Buddha in stated assemblies of the people held for that purpose. But in northern Buddhism there is a complete ritual, with rites and worship strangely like that of the Roman Catholic church, through whose missionaries these traits may have been introduced. In some countries the monks are exceedingly numerous; around Lhasa in Tibet, for instance, they are said to be one-third of the population. They live in *vihāras* or monasteries, and subsist partly by endowments, but mostly by charity. Except in Tibet, they are not allowed to engage in any secular occupation. The vow is not irrevocable. This incubus of monasticism constitutes the great weakness of Buddhism in its social aspect. Further particulars regarding Buddhist monks and monasteries, as well as the forms of Buddhist worship generally, will be given when speaking of the countries where the religion prevails. See LAMAISM.

The adoration of the statues of the Buddha

and of his relics is the chief external ceremony of the religion. This, with prayer and the repetition of sacred formulas, constitutes the ritual. The centres of the worship are the temples containing statues, and the *topes* or *tumuli* erected over the relics of the Buddha, or of his distinguished apostles, or they are located at spots which have become sacred as the scenes of the Buddha's acts. The central object in a Buddhist temple, corresponding to the altar in a Roman Catholic church, is an image of the Buddha, or a *dagoba* or shrine containing his relics. Here flowers,* fruit, and incense are daily offered, and processions are made with singing of hymns. Of the relics of the Buddha, the most famous are the *teeth* that are preserved with intense veneration in various places. Hiouen-Thsang saw more than a dozen of them in different parts of India; and the great monarch, Silāditya, was on the point of making war on the King of Kashmir for the possession of one, which, although by no means the largest, was yet an inch and a half long. The tooth of the Buddha preserved in Ceylon, a piece of ivory about the size of the little finger, is exhibited very rarely, and then only with permission of the English government—so great is the concourse and so intense the excitement. See CEYLON.

There appears at first sight to be an inconsistency between this seeming worship of the Buddha and the theory by which he is considered as no longer existing. Yet the two things are really not irreconcilable—not more so, at least, than theory and practice often are. With all their admiration of the Buddha, his followers have never made a god of him. Gautama is only the last Buddha—the Buddha of the present cycle. He had predecessors in the cycles that are past (24 Buddhas of the past are enumerated, and Gautama could even tell their names); and when, at the end of the present cycle, all things shall be reduced to their elements, and the knowledge of the way of salvation shall perish with all things else, then, in the new world that shall spring up, another Buddha will appear, again to reveal to the renaissance beings the way to Nirvāṇa. Gautama foretold that Maitreya, one of his earliest adherents, should be the next Buddha† (the Buddha of the future), and he gratified several of his followers with a like prospect in after cycles. The Buddha was thus no greater than any mortal may aspire to become. The prodigious and supernatural powers which the legends represent him as possessing are quite in accordance with Indian ideas; for even the Brahmins believe that by virtue, austerities, and science a man may acquire power to make the gods tremble on their thrones.

The Buddha, then, is not a god; he is the ideal of what any man may become; and the great object of Buddhist worship is to keep this ideal vividly in the minds of the believers.

* The quantity of flowers used as offerings is prodigious. A royal devotee in Ceylon, in the fifteenth century, offered on one occasion 6,480,320 flowers at the shrine of the tooth. At one temple it was provided that there should be offered "every day 100,000 flowers, and each day a different flower."

† One who is on the way to become a supreme Buddha, and has arrived at that stage when he has only one more birth to undergo, is styled a *Bodhisat* (having the essence of knowledge); a mere candidate for Nirvāṇa is an *arhat* (venerable). The northern Buddhists aim at becoming *Bodhisats*, or future saviors, and this marks them off from the older (selfish) ideal of becoming an *arhat*. The former is called the religion of the Great Vehicle, the latter that of the Little Vehicle (*mahāyāna* and *hinayāna*).

In the presence of the statue, the tooth, or the footprint, the devout believer vividly recalls the example of him who trod the path that leads to deliverance. This veneration of the memory of Buddha is perhaps hardly distinguishable, among the ignorant, from worship of him as a present god; but in theory, the ritual is strictly commemorative, and does not necessarily involve idolatry, any more than the garlands laid on the tomb of a parent by a pious child. See *TOPE*.

The prayers addressed to the Buddha are more difficult to reconcile with the belief in his having ceased to exist. It is improbable, indeed, that the original scheme of Buddhism contemplated either the adoration of the statues of the Buddha or the offering of prayers to him after his death. These are an aftergrowth—accretions upon the simple scheme of Gautama, and in a manner forced upon it during its struggle with other religions. For a system of belief that seeks to supplant other systems finds itself enticed to present something to rival and outdo them, if possible, in every point. Even the Christian Church, in the Middle Ages, adopted with this view many of the rites and legends of paganism that were quite inconsistent with its own character; merely casting over them a slight disguise and giving them Christian names. Prayer, too, is natural to man—an irrepressible instinct, as it were, that has to be gratified. And then the inconsistency in uttering prayers when there is no one to hear or answer, glaring as it appears to us, is by no means great to the Eastern mind. Prayers, like other formulas, are conceived less as influencing the will of any superior being to grant the request than as working in some magical way—producing their effects by a blind force inherent in themselves. They are, in short, mere incantations or charms. Even the prayers of a Brahman, who believes in the existence of gods, do not act so much by inclining the deity addressed to favor the petitioner, as by compelling him through their mysterious potency—through the operation of a law above the will of the highest gods. The Buddhist, then, may well believe that a formula of prayer in the name of "the venerable of the world" will be potent for his good in this way, without troubling himself to think whether any conscious being hears it or not.

The element in Buddhism which more than any other, perhaps, gave it an advantage over all surrounding religions, and led to its surprising extension, was the spirit of universal charity and sympathy that it breathed, as contrasted with the exclusiveness of caste. In this respect it held much the same relation to Brahmanism that Christianity did to Judaism. It was, in fact, a reaction against the exclusiveness and formalism of Brahmanism—an attempt to render it more catholic and to throw off its intolerable burden of ceremonies. Buddhism did not expressly abolish caste, but only declared that all followers of the Buddha who embraced the religious life were thereby released from its restrictions; in the bosom of a community who had all equally renounced the world, high and low, the twice-born Brahman and the outcast were brethren. This was the very way that Christianity dealt with the slavery of the ancient world. This opening of its ranks to all classes and to both sexes—for women were admitted to equal hopes and privileges with men,

and one of Gautama's early female disciples is to be the supreme Buddha of a future cycle—no doubt gave Buddhism one great advantage over Brahmanism. The Buddha, says Max Müller, "addressed himself to castes and outcasts. He promised salvation to all; and he commanded his disciples to preach his doctrine in all places and to all men. A sense of duty, extending from the narrow limits of the house, the village, and the country, to the widest circle of mankind, a feeling of sympathy and brotherhood toward all men, the idea, in fact, of humanity, were first pronounced by Buddha." For the relation of the Buddha to the philosophy of his time, see SANXYA.

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BUDDING. A method of perpetuating varieties of plants by inserting a bud or bud scion into a stock. There are numerous styles of budding, such as shield budding, square and circular shield budding, flute budding, hinge budding, and ring budding; here, however, only shield budding, the method in most common use, will be described. The bud is generally taken from wood of the present season's growth. Bud sticks for June budding may be selected any time during the dormant season and placed in cold storage until needed. Since the work of budding is done during the season of active growth, the bud sticks are usually prepared so that the petiole or stem of each leaf is left attached, to serve as a handle to aid in pushing the bud home when inserting it beneath the bark of the stock. The stock for budding should be at least as thick as an ordinary lead pencil. With the apple and pear a second season's growth will be necessary to develop this size, but with the peach a single season will suffice, i.e., peach stocks can be budded the same season the pits are planted; consequently the peach is left until as late in the season as is practicable in order to obtain suitable size of stocks.

The height at which buds are inserted varies with the operator. In general, the nearer the ground, the better. The cut for the reception of the bud is made in the shape of a letter T. Usually the crosscut is made at a slight angle with the body of the tree, instead of at right angles to it, and the stem to the T starts at the crosscut and extends towards the root for an inch or more. The flaps of bark caused by the intersection of the two cuts are slightly loosened with the ivory heel of the budding knife, and the bud, grasped by the leaf stem as a handle, is placed under the flaps and firmly pushed in place, until its cut surface is entirely in contact with the peeled body of the stock. A ligature is then tightly drawn about, above, and below the bud, to hold it in place until a union shall be formed. Bands of raffia 10 or 12 inches long make a most convenient tying material. As soon as the buds have united with the stock ("taken"), the ligature should be cut, in order to prevent girdling the stock and bud. This done, the operation is complete until the following spring, when all the trees in which the buds have "taken" should have the top cut off just above the bud. This forces the entire strength of the root into the bud, and since the root itself had not been disturbed by transplanting, a more vigorous growth usually results from the bud than from scions in whip or crown grafting.

Budding is one of the most economical forms of artificial reproduction, and each year witnesses its more general use. Some nurserymen have gone so far as to use it as a substitute for all other modes of grafting, save whip grafting, in the propagation of the dwarf pear. Budding is economical in the amount of wood used from which to take buds or scions, since a single bud does the work of the three or more upon the scion of the cleft or whip graft. But it is expensive in the use of stocks, a seedling being required for each tree, while with the piece-root system of grafting two, three, or more stocks can be made from a single seedling.

The one objection to budding is that it causes an unsightly crook in the body of the tree, unless the tree is planted deeply enough in the orchard to cover the deformity. In rigorous

climates, where trees upon tender roots are likely to suffer from severe winters, a bud of a hardy sort upon a tender root is no harder than the root, because budding leaves a portion of the stock exposed above the surface of the soil, and thus precludes the possibility of the development of roots from the portion above the bud; whereas a piece-root grafted tree with a long scion is practically the same as a tree propagated from a cutting, as the scion will strike root and the new plant will be upon its own root. In regions where severe winters do not enter as a factor, there are undoubtedly a number of reasons why budding will be the most desirable method of reproducing horticultural varieties. See **BUD**; **GRAFTING**.

BUDDLEIA, būd-lé'yá. A genus of shrubs of the family Loganiaceæ, all natives of the warmer parts of the world, comprising about 70 species. Some of the hardiest are cultivated as ornamental shrubs. They blossom freely in summer, producing violet or yellow flowers in panicles or globose heads. They are not quite hardy in the north. *Buddleia japonica*, *globosa*, *variabilis*, *lindleyana*, and *colvillei* are among the hardiest and most beautiful species.

BUDÉ. See **BUDÆUS**.

BUDENZ, bū'dǎnts, JOSEPH (1836-92). A Hungarian philologist. He was born at Rasdorf, Germany, and was educated at Marburg and Göttingen. In 1858 he went to Hungary, where he became a member of the Academy of Sciences (1862), and professor of comparative Altaian philology at the University of Budapest—a chair created especially for him. His important and varied contributions to this subject include *Finn nyelvtan* ('Finnish Grammar,' 5th ed., 1900), and *Magyar-ugor összehasonlító szótár* ('Magyar-Ugrian Comparative Dictionary,' 1873-81).

BUDGE, ERNEST A. WALLIS. A very learned and prolific English Orientalist. He was educated at Christ's College, Cambridge, where he became distinguished in the Semitic languages and afterward was appointed keeper of Egyptian and Assyrian antiquities in the British Museum. Of his numerous scholarly works may be cited: *Assyrian Texts* (1880); *Inscriptions of Nebuchadnezzar* (1883); *Babylonian Life and History* (1884); *The Dwellers on the Nile* (1885); *Coptic Martyrdom of George of Cappadocia* (1888); *History of Alexander the Great* (1889); *The Life of Rabban Hormizd* (1894); *Coptic St. Michael the Archangel* (1894); *Oriental Wit and Wisdom* (1896); *Laughable Stories, Translated from the Syriac* (1899); *The Miracles of the Virgin Mary, The Life of Hannâ, Magical Texts of Za-Waldâ-Hawâr-Yât*, etc. (1900); *A History of Egypt*, etc. (1902); *The Egyptian Sûdân* (1907); *Texts relating to St. Mend* (1909); *Liturgy of Funeral Offerings*, etc. (1909); and *Coptic Biblical Texts* (1912); *Syrian Anatomy, Pathology, and Therapeutics: "The Book of Medicines"* (1913); besides a very long list of monographs on special subjects involving a minute knowledge of Nubian, Assuan, and modern Egyptian, Coptic, Arabic, and other languages and dialects.

BUDGE, JULIUS (1811-88). A German physiologist. He was born at Wetzlar and studied at the universities of Marburg, Würzburg, and Berlin. He afterward successively became extraordinary professor at Bonn (1847-56) and professor of anatomy and physiology at Greifswald, where he was also director of the ana-

tomical institute. He pointed out the relation between parts of the brain on the one hand and the genito-urinary organs on the other, and made the important discovery that the sympathetic nerve has its origin in the spinal cord and not in the peripheral ganglia. He also discovered the capillaries of the gall. Among his principal works are the following: *Die Lehre vom Erbrechen* (1840); *Untersuchungen über das Nervensystem* (2 vols., 1841-42); *Allgemeine Pathologie* (1843); *Lehrbuch der speziellen Physiologie des Menschen* (1848; 8th ed., 1862); *Kompendium der Physiologie* (3d ed., 1875).

BUDGELL, EUSTACE (1686-1737). An English essayist. He studied at Trinity College, Oxford, and at the Inner Temple and was admitted to the bar. In 1709 he was appointed a clerk, and in 1710 undersecretary to his second cousin, Joseph Addison, then secretary to the Lord Lieutenant of Ireland. He afterward was chief secretary to the lords justices and deputy clerk of the council, and was elected to the Irish House of Commons. In 1717 he obtained through Addison the lucrative post of Accountant General. Soon, however, he quarreled with Webster, the new Secretary for Ireland, wrote a pamphlet against the new Lord Lieutenant, the Duke of Bolton, lost his places, and returned to England. He lost more than £20,000 in Law's South Sea scheme, and spent a quarter as much in a vain attempt to be chosen to Parliament. He wrote violent pamphlets against the ministry, and from February, 1733, to June, 1735, published *The Bee*, a weekly. In 1733 he was accused of having made away with a bond for £1000 advanced to him by Matthew Tindal (q.v.), the deist, and with having inserted in Tindal's will a bequest of 2000 guineas to himself. He did not secure the bequest, and in despair he drowned himself in the Thames. Pope had a bitter spite against Budgell and alludes to the forgery in the "Epistle to Dr. Arbuthnot." Budgell wrote for the *Spectator*, for the most part over the signature 'X.', 37 papers, of which "Sir Roger as a Hunter" (No. 116, Friday, July 13, 1711) is perhaps as good as any. He had also written for the *Tatler* and the *Guardian*, and published a translation (1714) of the *Characters of Theophrastus*, and the *Memoirs of the Life and Character of the Late Earl of Orrery and the Family of the Boyles* (1732). Consult his *Liberty and Property: A Pamphlet* (London, 1732). His illegitimate daughter Anne was a well-known Drury Lane actress.

BUDGERIGAR (Anglo-Australian). A dealer's name (variously spelled) for the common Australian undulated grass parrakeet. Dealers generally call them shell parrakeets. Their scientific name is *Melopsittacus undulatus*. For keeping in captivity they are the commonest and most popular of the parrakeets, and hundreds are annually imported into this country. They combine qualities which are ideal in cage birds—beauty, vivacity, hardiness, and prolificacy. A pair may be purchased in almost any bird store for about \$2.50. The budgerigar is bright green with black wavy crossbars on the back. The face is yellow and the tail blue. The cock has the fleshy cere at the base of the beak colored blue, while in the hen it is brown. Two rare varieties of this parrakeet are yellow and blue in color, the dark pigment in the former and the yellow in the latter being absent. If a good-sized aviary is available, four or five pairs may be confined together, but in a small

cage only a single pair, where they will live for many years and if given proper facilities will breed and rear nestfuls of young birds. Warmth is necessary only if exposed to the storms of midwinter. Canary seed may be their only diet with water, and grit strewn on the floor of the cage. A nesting box with a small round entrance hole, partly filled with sawdust, will answer all their requirements.

BUDGET (Fr. *bougette*, bag, wallet, dim. of OF. *bouge*, a leather bag; hence a bag with its contents, as, e.g., of news, information; cf. Lat. *fiscus*, originally basket, then money basket, then public treasury). In its primary significance a term which designates the periodical financial statements laid before a legislative body. As such it embraces the report of receipts and expenditures for a prior fiscal period, and an estimate of the receipts and expenditures for a future period. From these preliminary estimates, which are the basis of legislation, the term has been extended to cover the aggregate of legislative enactments relating to the receipts and expenditures of a given period. The method of preparing and voting the budget varies greatly. An ideal budget would calculate revenue and expenditure with such nicety as to bring about an exact balance; but such precision is practically impossible except when the revenue system by its elasticity permits an adjustment of income to expenditure.

In England the Chancellor of the Exchequer submits to Parliament an annual statement of the expenditures deemed necessary by the government. He is responsible for the entire expenditure, both in the departments of other ministers and in his own. It is therefore his duty to harmonize the estimates of the several ministers, and in so doing he may curtail the appropriations requested by some of his colleagues. The revenue as a whole is fixed and is not voted annually by Parliament. Yet it is the practice in England to regard the income tax and the tea duties as variable elements to be increased or diminished, as occasion arises. Proposals for such changes are an essential part of the budget.

In the United States the budget is practically prepared in the House of Representatives. To the latter at the opening of each session of Congress the Secretary of the Treasury submits a book of estimates of expenditures to be made for the coming fiscal year. He transmits without revision the estimates made by the several cabinet officers, and the heads of offices are not directly subordinated to the eight executive departments. These estimates form the basis upon which the several appropriation bills are prepared by the committees of the House of Representatives. Thus the work of preparing the budget is decentralized, and the adjustment of expenditures to income which results is not so satisfactory as in other countries. In recent years many suggestions have been made for improving Federal budgetary practice and in June, 1912, President Taft directed the heads of departments to prepare two sets of estimates, one of which should be in the form required by existing law, and the second according to a form prescribed by the President, adapted to the formation of a unitary budget. Congress, by Act of Aug. 24, 1912, provided, however, that the annual estimates should retain their traditional form. In his message of Feb. 26, 1913, President Taft strongly recommended a

reform of the budget. No action was taken upon the subject by Congress. Consult: Wilson, *The National Budget* (London, 1882); Adams, *Finance* (New York, 1900); Griffin, *Select List of References* (Washington, 1904); Agger, *The Budget in the American Commonwealth* (New York, 1907); *United States President's Commission on Economy and Efficiency* (Washington, 1912). See FINANCE; TAX AND TAXATION; DEBT, PUBLIC.

BÜDINGER, bŭ'dīng-ēr, MAX (1828-1902). A German historian, born at Cassel and educated at the universities of Marburg, Bonn, and Berlin. He was professor of history at Zurich from 1861 to 1872 and at Vienna from 1872 to 1899. The scope of his researches is suggested by the following titles of some of his books: *Oesterreichische Geschichte bis zum Ausgange des dreizehnten Jahrhunderts* (1858); *Untersuchungen zur römischen Kaisergeschichte* (3 vols., 1868-70); *Ein Buch ungarischer Geschichte* (3 vols., 1870); *Universalhistorie im Altertum* (1895); *Die Universalhistorie im Mittelalter* (1898).

BÜDÖS-HEGY, bŭ'dēsh-hēd'y' or BUDASBERG (Hung. *Büdös*, stinking, referring to the sulphurous exhalations, and *hegy*, mountain). A volcanic mountain belonging to the Carpathian system, situated near the southeastern border of Transylvania, in lat. 46° 12' N. and long. 25° 40' E. It is quite isolated and steep-sided, densely wooded on the lower slopes, and has an elevation of about 3300 feet. It has numerous caverns that emit sulphurous exhalations, and from its base issue strong sulphur springs.

BUDRUN, bōō-drōōn', or **BUDRUM**, bōō-drōōm. A seaport town of Asiatic Turkey, in the vilayet of Smyrna, finely situated on the north shore of the Gulf of Cos, about 96 miles south of Smyrna (Map: Turkey in Asia, B 4). It occupies the site of the ancient Halicarnassus, and the massive remains of the old city, which was "the largest and strongest in all Caria," bear witness to its former magnificence. A fortress, built by the Knights of Rhodes in 1402, occupies a projecting rock on the eastern side of the harbor, which is shallow but well sheltered. Pop. estimated at 6000.

BUDWEIS, bōōd'vīs (Czech *Budějovice*, the district of hut villages, from Ger. *Bude*, Slav. *buda*, Eng. *booth*). A town of the Austrian Crownland of Bohemia, situated on the Moldau at its junction with the Maltach, 1235 feet above sea level, and about 77 miles south of Prague (Map: Austria-Hungary, D 2). Its most noteworthy buildings are the cathedral, with a detached bell tower; the old and the new Rathaus; the Gothic church of St. Mary, and the bishop's palace. The town's affairs are administered by a municipal council of 36 members and it owns its water supply and gas works. In its educational institutions instruction is given in both the Bohemian and German tongues. Its industry consists of manufactures of earthenware, porcelain, majolica, lead pencils, sugar, chemicals, matches, paper, machinery, bricks, tiles, beer, and spirits. Being a railroad junction and a river port, Budweis is the trade centre of south Bohemia. The chief articles of commerce are corn, timber, lignite, salt, industrial products, and beer. In the neighborhood of the town stands the fine castle of Frauenberg, belonging to Prince Schwarzenberg. The town has a comparatively high death rate, which exceeds 25 per 1000. Pop., 1890, 24,500; 1910,

45,137, mostly Czechs. Budweis was founded in 1265 by King Ottokar II. After the Thirty Years' War it received many privileges and became in 1783 the capital of an episcopal see.

BUD WORM. See BOLLWORM.

BU'EL, SAMUEL (1815-91). An American clergyman, born in Troy, N. Y. He graduated at Williams College in 1833 and at the General Theological Seminary (N. Y.) in 1837, and was rector in Marshall, Mich., Schuylkill Haven, Pa., Cumberland, Md., Poughkeepsie, N. Y., and New York City. Subsequently he was professor successively of ecclesiastical history and of divinity at the Seabury Divinity School, Fribault, Minn., and from 1871 to 1888 professor of systematic divinity and dogmatic theology at the General Theological Seminary. His publications include: *The Apostolic System of the Church Defended* (1844); *The Eucharistic Presence, Sacrifice, and Adoration* (1874); *A Treatise of Dogmatic Theology* (1890).

BUELL, DON CARLOS (1818-98). An American soldier, prominent on the Federal side in the Civil War. He was born near Marietta, Ohio, within the limits of the present Lowell, and graduated at West Point in 1841. During the Mexican War he served under General Taylor and under General Scott, and for his gallantry at Churubusco, where he was severely wounded, was brevetted major. At the outbreak of the Civil War he was appointed brigadier general of volunteers. He assisted for two months in organizing the army at Washington, and in November replaced Gen. W. T. Sherman in command of the Department of the Ohio. He occupied Bowling Green, Ky., on Feb. 14, 1862, and, advancing into Tennessee, took possession of Nashville on February 25. On March 21 he was raised to the rank of major general of volunteers, his department at the same time being merged into that of the Mississippi, then under the command of General Halleck. On April 6-7 he took a prominent part in the battle of Shiloh, bringing his fresh troops upon the field towards the close of the first day's fighting, and on the following day helping to defeat the weakened Confederates. (See SHILOH, BATTLE OF.) On June 12 he assumed command of the Army of the Ohio and soon afterward was called upon to repel Bragg's invasion of Kentucky. After an exciting march he arrived first at Louisville on September 24, and then, turning upon the Confederate army, forced it to retreat, overtook and crippled it at Perryville on October 8 (see PERRYVILLE, BATTLE OF), and pursued it across the State, though, according to some military critics, his pursuit was marked by an unfortunate lack of enterprise and vigor. On the 24th he was replaced by General Rosecrans, and from November, 1862, to May, 1863, was before a military commission appointed to investigate his campaign in Tennessee and Kentucky. This commission presented an adverse report, which, however, has never been published in full. Buell refused to accept any further assignments to active duty, though several were offered him, and on June 1, 1864, he resigned from the service. After the war he was president of the Green River Iron Works from 1865 to 1870 and served as United States pension agent at Louisville, Ky., from 1885 to 1889. For Buell's side of the controversy consult *Statement of Major-General Buell in Review of the Evidence before the Military Commission Appointed by the War Department*. Consult also Fry, *Operations of*

the Army under Buell (New York, 1884); *Military Historical Society of Massachusetts, Campaigns in Kentucky and Tennessee* (Boston, 1908); also their *Papers*, vol. viii, p. 99 ff. (Boston, 1910).

BUENA VISTA, bwā'nā vēs'tā (Sp. good view). A small settlement in Mexico on the San Juan, a tributary of the Rio Grande, 7 miles south of Saltillo. Here, on Feb. 22 and 23, 1847, during the war between the United States and Mexico, about 4800 Americans under General Taylor defeated fully 20,000 Mexicans under Gen. Santa Anna in the most brilliant battle of the war. The Americans, having taken up a position of great strength on the 21st, stood on the defensive and awaited Santa Anna's attack. On the afternoon of the 22d the Mexicans began the battle, though the main attack was made on the 23d, the conflict continuing with slight intermission throughout the day, and the troops on each side fighting with the utmost gallantry. The American artillery was served with remarkable efficiency, and Santa Anna's attacks were uniformly repulsed, so that early on the 24th he was compelled to retreat. The Americans lost 746 in killed and wounded, the Mexicans fully 2000. The battle virtually closed the campaign in the north, and, by weakening and detaining Santa Anna, contributed to the successes of General Scott in the south. An incident during the battle furnished the theme of Whittier's poem, "The Angels of Buena Vista." Consult: J. H. Carleton, *The Battle of Buena Vista* (New York, 1848); H. H. Bancroft, *History of Mexico*, vol. v (San Francisco, 1885); O. O. Howard, *General Taylor* (New York, 1892); Wilcox, *History of the Mexican War* (Washington, 1892); Hitchcock, editor, *Decisive Battles of America* (New York, 1909).

BUENA VISTA. A city in central Virginia, 40 miles north by west of Lynchburg, on the North River, and on the Norfolk and Western and the Chesapeake and Ohio railroads (Map: Virginia, E 4). It is the seat of the Southern Seminary, for girls, and has foundries and manufacturing of pulp, fertilizers, and leather. The water works are owned by the municipality. Pop., 1890, 1044; 1900, 2388; 1910, 3245.

BUENAVISTA, SAN JOSÉ DE. See SAN JOSÉ DE BUENAVISTA.

BUEN AYRE, bwān 'rā, or **BONAIRE** (Sp. *buēn*, Fr. *bon*, fair, good + Sp. *ayre*, Fr. *air*, Eng. *air*). One of the West Indian islands, belonging to the Dutch, situated in lat. 12° 2' N. and long. 68° 22' W., 30 miles east of Curaçao (Map: West Indies, E 4). The chief products are timber and cattle. It has an area of 95 square miles and a population of (1910) 6383.

BUENOS AIRES, bwā'nōs 'rās or bō'nūs ā'rīz (Sp. good air; see BUEN AYRE). The largest and most important province of Argentina, on the eastern coast, bounded by the river Paraná and the provinces of Santa Fé and Córdoba on the north, by the Atlantic on the east and south, and by the Province of Córdoba and the territories of Pampa Central and Río Negro on the west (Map: Argentina, E 11). The area is stated at 305,121 square kilometers (117,807 square miles). Excepting the southern part, which is crossed by two low mountain chains, the province consists of an extensive plain, for the most part treeless, dotted with small lakes and intersected by short streams. The coasts are generally low and sandy, and only slightly indented, though

the southeastern part has several promontories; the best ports are Bahía Blanca and La Plata. The chief rivers are the Paraná (with its estuary, the Río de la Plata), which borders it on the northeast, and the Río Salado. Numerous lakes and lagoons are connected by short streams, too shallow for navigation, but of considerable value for purposes of irrigation. The climate is healthful. The soil is very fertile and especially adapted to grazing and the growing of cereals. The live-stock census of May, 1908, returned 10,351,235 cattle, 2,519,953 horses, 14,469 mules, 4344 asses, 34,604,072 sheep, 11,335 goats, and 711,241 swine. During recent years the live-stock interests have shown a tendency to decline, due to the increased activity in agricultural pursuits. The cultivated area increased from 177,000 hectares in 1872 to 1,395,129 in 1895 and 8,440,300 in 1910. In the latter year 2,328,810 hectares were under wheat, 1,450,000 corn, 713,070 oats, 465,120 linseed, and about 2,000,000 alfalfa. The total cultivated area was more than one-third that of the entire country. The value of the province's agricultural and live-stock production in 1912 is estimated at 413,639,758 pesos gold, as compared with 1,123,830,112 for the republic. The commerce and shipping are naturally very extensive, both on account of the large volume of local products and from the fact that through its geographical position the province controls the foreign commerce of the republic. The chief exports are wool, beef, and other animal products, and wheat and linseed. Of manufactured products very little is left for export, after domestic consumption. Railways, which connect the important centres, aggregated 4523 kilometers (2810 miles) in 1895 and 10,560 kilometers (6527 miles) in 1910.

In its administration the province is independent of the central government, not only in local affairs, but also in external financial transactions. The executive power is vested in a governor and vice governor, elected indirectly for three years. The legislative power is exercised by a Congress consisting of a Chamber of Deputies of not more than 100 members, elected biennially, and a Senate of not more than 50 members, elected triennially. Congress holds annual sessions from May 1 to August 31. The whole province is divided into four sections for judicial purposes, and there is a supreme court at La Plata. Administratively the province is composed of 100 districts, under the control of their chief municipalities. Capital, La Plata. Pop., 1881, 684,555; 1895, 921,168; 1905 (est.), 1,392,208; Dec. 31, 1910 (est.), 1,921,183. These figures do not include the city of Buenos Aires, which is not a part of the province.

BUENOS AIRES. The capital of Argentina (Map: Argentina, F 10), on the south shore of the Río de la Plata, 175 miles from its mouth, and 125 miles west of Montevideo (lat. 34° 36' 21" S., long. 58° 21' 33" W.). The river here is 30 miles wide, and the city is only 15 to 25 feet above sea level, in a flat plain. Buenos Aires enjoys a moderate temperature, which does not vary greatly (the average being 62.6° F.), and which usually ranges between 79° in January and February and 55° in July and August. Winds and rainstorms are frequent. The average annual rainfall is 34 inches. The area of the city, coextensive with the Federal District, is stated at 18,854 hectares (72.8 square miles). It is regularly laid out, the

streets for the most part crossing at right angles. They are lighted by gas, petroleum, and electricity, and compare favorably in appearance with those of large European cities. There are many beautiful thoroughfares, squares, and parks, the finest avenue being the Avenida de Mayo, 98.5 feet wide, notable for its elaborate public and business edifices. The Avenida Alvear is conspicuous for its fine residences, and the suburban districts of Belgrano and Flores have many attractive country houses and gardens. The Plaza 25 de Mayo, over 1200 feet long and 640 feet wide, is surrounded by many handsome buildings, such as the episcopal palace, the cathedral, the hall of Congress, the exchange, the post office, the government palace, the palace of justice, the municipal building and department of police, and the Hotel Argentina. In the middle of the square stands a magnificent statue of Liberty upon a handsome column; and an equestrian statue of General Belgrano is erected before the government palace. At the northern end of the city is the Parque Tres de Febrero (3d of February), of 367 hectares, containing zoological gardens, an aquarium, lakes for boating, etc. There are about 25 Roman Catholic churches and 4 Protestant churches besides the cathedral, a magnificent edifice (dating from 1752) in the style of the Madeleine, Paris. The city has about 20 theatres, of which the most important is the Teatro de la Opera. There are also a race track, situated in the suburb of Palermo, and public places for games and athletic sports.

Administration and Public Institutions.

The executive power is exercised by a mayor appointed by the president of the republic. The city is divided into 14 sections, which elect the municipal council, and for the administration of justice into 20 districts, each with a justice of the peace. Numerous electric and horse tramways facilitate communication throughout the city. The length of tramway track is reported at 677 kilometers (421 miles). There are six terminal stations of railways connecting Buenos Aires with the north, south, and west, while numerous steamers run from here to Montevideo and towns along the Paraná and Uruguay rivers as far as the confines of Brazil. The city is connected with foreign countries by cable and has an extensive telegraph and telephone system.

In the primary schools there were 125,542 pupils at the end of 1911; in the five colleges for secondary education, 3287 students, and in the girls' high school, 315. There are various training, commercial, and special schools. The National University ranks among the finest in South America (see BUENOS AIRES, UNIVERSITY OF). There are two public libraries, a museum of natural history, with the famous Burmeister collection, and numerous scientific and literary societies and clubs. The newspapers and periodicals published in the city number more than 100, many of them being issued daily, in Spanish, German, Italian, French, or English. There are upward of 20 hospitals and insane asylums, homes for foundlings and orphans, and a shelter for immigrants, the last being aided by the state. The city also maintains shelters for the night, a Pasteur institute, and a crematory. There are 28 theatres and several circuses, race courses, etc.

On account of the low situation of the city, improved methods of drainage and house and street cleaning have been put into operation, the

refuse collected being burned by the city. Water is supplied by the municipality, drawn from the Plata north of the city and purified by filtration. There is a well-organized system of police and fire protection. Formerly Buenos Aires was at a disadvantage because of the lack of a harbor, the Plata being so swift and shallow at this point that sailing vessels had to anchor 14 miles down the river, the cargoes being transported to the city in lighters. At present there is a large and complete system of basins along the water front, permitting vessels of 22 feet draught to dock within a short distance from the principal business portion of the city and to connect at the water's edge with the railroad terminals.

Manufactures and Trade. In 1910 there were about 10,350 factories in the city, with a capital of 266,400,000 pesos (paper) and 118,315 employees. The principal establishments produce furniture, carriages, machinery, leather, shoes, hats, woven goods, tobacco, and liquors. Of the total Argentine foreign trade, about 60 per cent was credited to Buenos Aires in 1912, imports being \$339,034,000 and exports \$176,016,000; Buenos Aires is thus the second port in America (New York being the first) and the eighth in the world. The most important articles of export are wool, sheep, and cattle products, as well as live stock, and notably grain. Exports go chiefly to Europe, though the city has a large trade with the United States. The over-sea tonnage entered and cleared in 1911 was 11,192,241. The city has 25 discount banks and one mortgage bank.

Population. Buenos Aires is a conspicuously cosmopolitan city and shows a most notable urban development. It is the largest city in the Southern Hemisphere and, after Paris, the largest Latin city in the world. At the beginning of the nineteenth century its population was probably about 40,000; in 1852, about 76,000; in 1869 (the time of its first authentic census), 177,767. In 1887 the suburbs of Belgrano and Flores, with some 28,000 inhabitants, were annexed, and the population of the enlarged city numbered about 433,000. The national census of 1895 returned 663,854 inhabitants; the municipal census of 1904, 950,891, and the municipal census of Oct. 16, 1909, 1,231,698; the estimate of April 1, 1913, 1,444,082. The 1909 census showed 662,364 Argentinians, 227,041 Italians, 174,291 Spaniards, and 26,784 Uruguayans. Buenos Aires is an expensive city for residence, and the authorities advise immigrants to proceed to the provinces. The death rate in 1910 was 15.9.

History. Buenos Aires has played an important part in South American history. Three different attempts were made to establish a colony on the present site of the city. The first was made in 1535 by Don Pedro de Mendoza, who called the place Ciudad de la Santísima Trinidad y Puerto de Santa María de Buenos Aires, after Our Lady the Virgin Mary of good airs or winds. Through mismanagement, as well as the hostility of the natives, this settlement proved a failure, and the colonists went up the river to Asunción, which had also been founded by an expedition sent out by Mendoza. The second attempt was made in 1542 by part of an expedition that left Spain under the leadership of Cabeza de Vaca. The successful foundation of the city was made in 1580 by Juan de Garay, who was Governor of Paraguay. It successfully

resisted attempts of the French and Dutch to capture it during the seventeenth century, and in 1776 it became the capital of the new viceroyalty of the Río de la Plata or Buenos Aires. After driving out the English, who had taken the city by surprise, in 1806, the inhabitants repelled another attack in the following year. On May 25, 1810, a great armed assembly met here and formed a provisional junta to replace the viceroy. The acts of the junta were issued in the name of Ferdinand VII, but the action was revolutionary, and the Argentines have always considered May 25 as the birthday of their independence. On July 9, 1816, the revolutionary congress (which had convened at Tucumán in the preceding March) formally declared the separation of the United Provinces of the Río de la Plata, and July 9 is celebrated as a second national holiday. The port was blockaded by the French and English in 1845. After the struggle between Rosas and Urquiza in 1851, Buenos Aires seceded from the republic, and till 1859 formed, with the surrounding province, a separate state. Since that time the city has been part of the confederation and, by a decree of 1880, was declared to be federal property and the capital of the nation. It was thus entirely divided from the province bearing its name. In 1871 the city suffered a terrible epidemic of yellow fever.

Consult: T. A. Turner, *Argentine and the Argentines* (New York, 1892); Bureau of the American Republics, *Handbook of Argentine Republic*, *Bulletin* 67 (Washington, 1892); *Anuario estadístico de la ciudad de Buenos Aires*; Curtis, "Buenos Ayres," in *The Chautauquan*, vol. xxix (Meadville, Pa., 1899); *Buenos Aires, Estadística Municipal*, *Oficina de*, general census of the population, buildings, trade, and industry of the city, 3 vols. (Buenos Aires, 1910); Saldías, *Buenos Aires en el centenario de la revolución de Mayo, 1810-1910* (La Plata, 1910).

BUENOS AIRES, UNIVERSITY OF (*Universidad Nacional de Buenos Aires*). The largest educational institution in South America, founded in 1821 by consolidating several struggling educational institutions. The new foundation was charged, like the Napoleonic foundations in France, with the administration of all official instruction—elementary, secondary, and collegiate. It has about 4650 students and a library of 97,000 volumes. Its faculties include law and social science, medicine, mathematics, natural science, philosophy, and letters.

BUFARIK, bū'fá-rék'. See BOUFFARIK.

BUFF, būf, HEINRICH (1805-78). A German physicist and chemist. He was born at Rödelsheim, near Frankfurt, and studied at the universities of Göttingen and Giessen (under Liebig), and with Gay-Lussac in Paris. He was for many years professor of physics at the University of Giessen. His principal works are the following: *Versuch eines Lehrbuchs der Stöchiometrie* (1829; 2d ed., 1841); *Grundzüge des chemischen Teils der Naturlehre* (1832); *Grundriss der Experimentalphysik* (1853); *Lehrbuch der physikalischen und theoretischen Chemie*, in collaboration with Kopp and Zammminer, as vol. I of Otto's well-known *Lehrbuch der Chemie* (3d ed., 1885). He was associated with Liebig in founding (1847) the celebrated *Jahresbericht über die Fortschritte der Chemie*.

BUFFALMACCO, bū'fál-mák'kò, BUONAMICO (c.1300-50). The adopted name of a Flor-

entine painter baptized Buonamico. He is mentioned in Boccaccio's *Decamerone* and Sacchetti's *Novelle*, but until 1910, when his frescoes of the "Passion" in the Badia of Florence were uncovered, and his biography written by Peleo Bacci, there was no reliable information concerning him, and he has even been considered a mythical figure. Sacchetti calls him a pupil and assistant of Andrea Tafi. Unfortunately almost all his work has been destroyed. The frescoes in the Campo Santo of Pisa, in San Petronio, Bologna, and in San Francesco, Assisi, which were attributed to him by Vasari, have been proved the handiwork of later artists. The frescoes in the Badia of Florence, though much damaged, show Buffalmacco as an artist of singular originality and power, far superior to any of his contemporaries, except Giotto (q.v.), from whose influence he held aloof. Consult Bacci, in *Bollettino d'arte* (Rome, 1911).

BUFFALO (Sp. *búfalo*, ML. *bufalus*, Lat. *bubalus*, wild ox, from Gk. *βούβαλος*, *boubalos*, a species of African antelope). Properly, an ox of the restricted bovine genus *Bubalus*, and specifically *Bubalus bubalus*, or *Bos bubalus*, of India. The word, however, has been broadly applied not only to many heavy oxen, such as those of Africa, and to the American bison (see BISON), but also to certain large antelopes (see BUBALIS, to which, perhaps, it originally belonged), and to other large ruminants; thus the city of Buffalo, N. Y., probably derives its name through a misnomer by early wanderers of the wapiti. The buffaloes proper form a group of oxen "chiefly characterized by their more or less flattened and angulated horns, which incline upward and backward, with an inward curve towards their tips, and are placed before the . . . vertex of the skull." The type is the INDIAN or WATER BUFFALO, of which small wild herds still exist in many parts of India, the finest belonging to Assam and Burma. This animal, called by the natives "arne" (Hind. masc. *arna*, fem. *arni*), is the largest of wild cattle, standing 6 feet high at the withers, and having a spread of horns, sometimes exceeding 6 feet. It is bluish black, nearly hairless, and frequents swampy jungles, where it is regarded as exceedingly dangerous, as it will charge a man entirely unprovoked and when perhaps its presence is unsuspected. A band forming a circle, with lowered heads, around the cows and calves defy the bear or tiger, and a lone bull has been known to vanquish a tiger in single combat; combats between them have been a favorite sport among Indian princes. This buffalo has long been domesticated, first on the Indian plains, whence it was carried elsewhere in prehistoric times. It is highly valued in Malaya, China, and Japan, especially where rice is cultivated, and the *carabao* of the Philippines is only a variety of it. It reached Egypt very long ago, but subsequently to the era of the monuments and picture writings; and it has gone far up the Nile, and will probably be carried much farther into the swampy region now opening to civilization, because of its usefulness in soft, wet lands, and its fondness for coarse aquatic vegetation in preference to dry and more costly forage. It has long been used, also, in the Niger valley. It was introduced into Italy later than Roman times and thrives in the Pontine marshes on the pestilential Maremma; and it plays an important part in western Asia, Turkey, Hungary, and southeastern Spain. "The

buffalo loves mud and moist ground," says Hornaday (*Two Years in the Jungle*), "and nature has provided these broad splay feet to prevent the animal from sinking too deeply in the mud. He carries his head precisely like a camel, low down, with nose thrust far forward . . . and to look at the whole head one would say that the beast was created with especial reference to running rapidly through very thick brush." It is said to be far more powerful than the ox and capable of dragging or carrying a far heavier load. The female yields a much greater quantity of milk than a cow, and of excellent quality, from which the *ghee* or semifluid butter of India is made. The hide is greatly valued for its strength and durability, but the flesh is very inferior to that of the ox. See CATTLE.

The AFRICAN BUFFALOES are of two species: the South African or Cape Buffalo (*Bubalus*, or *Bos*, *caffer*), which also extends northeasterly to Abyssinia; and the West African species (*Bubalus*, or *Bos*, *pumilus*). These may be separable into several distinct species or varieties. The typical and well-known South African buffalo is nearly the equal in size of the Indian one, and like it has a bluish-black hide, in old age almost completely hairless. Its horns, however, are somewhat shorter and spread sideways with up-curved ends from the forehead, where the bases nearly meet in a broadly flattened expanse, making a rough buckler of horn. They frequent marshes and rivers, wading about in the water most of the time and eating the aquatic vegetation. Formerly they gathered in large herds, but now are rarely seen except in small bands, and they have disappeared entirely from all the settled regions. Their scent is remarkably keen, and they are warned of the approach of a disturber by the birds (see BUFFALO BIRD), which remain near them and are vigilant. They are justly regarded as exceedingly dangerous by sportsmen, since when wounded they will charge with extreme speed and ferocity. They are, however, overcome by lions and leopards and sometimes pulled down by crocodiles or chased to exhaustion by packs of wild dogs. This animal has not been tamed or domesticated, but its hide is much valued for its thickness and strength.

The West African species is smaller, has shorter and less massive horns, and is ruddy brown or yellowish in color. Its habits seem to be similar to those of the more southern species, and it is widely distributed in Central Africa. The zomouse of Sierra Leone is typical of this species. The small wild ox of the Celebes is a near relative of the buffaloes. See ANOA; BANTENG; BISON; GAUR; YAK; EXTINCT ANIMALS.

BUFFALO (named from Buffalo Creek). The county seat of Erie Co., N. Y., one of the most important commercial ports of the Great Lakes, and, next to New York, the largest city in the State (Map: New York, B 3). It is at the eastern end of Lake Erie, at the head of the Niagara River, 20 miles above Niagara Falls, 540 miles east of Chicago, 297 miles west of Albany, and 410 miles by rail northwest of New York.

Description. The city occupies an area of 42 square miles. It is situated on ground rising gradually from the lake to an extended plain at an elevation of 50 feet (altitude 600 feet above sea level). The streets generally are broad. As a rule, they cross each other at right angles and are beautifully shaded and well paved, considerably more than half (376.5 miles) of the

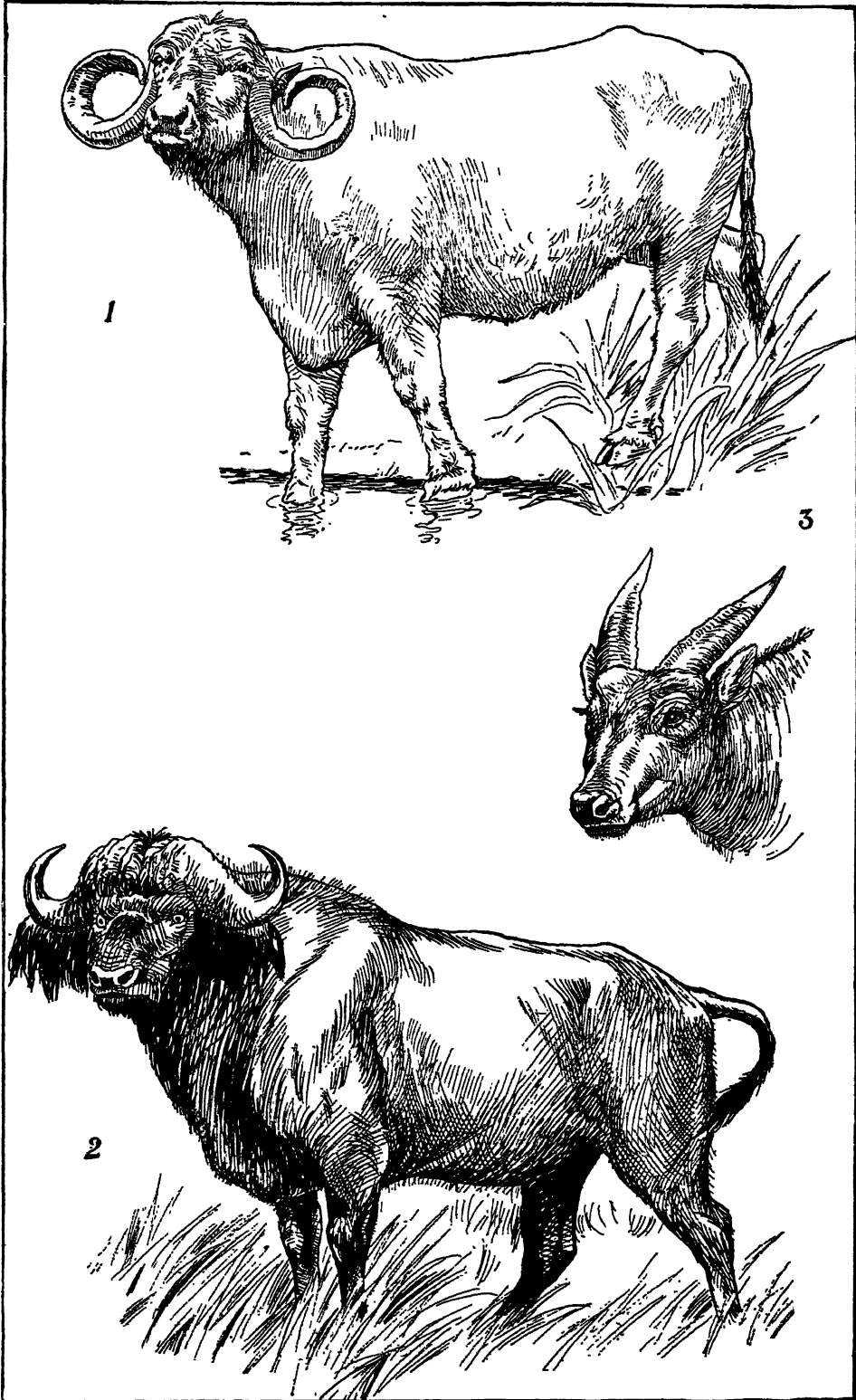
total street mileage being paved and about two-thirds of this distance (240.8 miles) with asphalt. Main Street, the principal business thoroughfare, runs northerly from the lake front. Near Lafayette Square, Niagara Street, the main road to Tonawanda, starts from Main Street on a diagonal line. This is the centre of the business district. Here are the large office buildings, including many tall, steel-framed structures. The residential sections of Buffalo are marked by the large proportion of detached houses owned by the occupants. In the fashionable district the principal avenues are Delaware Avenue, Summer, Ferry and North streets, and Lincoln Parkway; here the houses are surrounded by ample lawns and trees and shrubs, which give this section of the city the picturesque appearance of a suburb. The same features of domestic architecture are carried out in the newly developed sections of the North Side. Many handsome buildings adorn the city; among these mention may be made of the United States Government Building, which cost about \$2,000,000; the city and county hall, of granite, with a tower 245 feet high; the Marine Bank Building; the New York Telephone Building; the Electric Building; the State Normal School; the Technical, Hutchinson, South Side, and Masten Park high schools (the latter being rebuilt after a fire); the Seventy-fourth and Sixty-fifth Regiment armories; Music Hall; Merchants' Exchange; Masonic Temple; Albright Art Gallery; Y. M. C. A. Building; Fitch Institute; General Hospital; Children's Hospital; Homeopathic Hospital; State Insane Asylum; the Erie County Penitentiary; Buffalo Library; Grosvenor Library; the Roman Catholic and Protestant Episcopal cathedrals; Chamber of Commerce Building; the Erie County Savings Bank; Buffalo Savings Bank; Mutual Life and Prudential buildings; the D. S. Morgan Building; and Elliott Square, the last named covering an entire block, and said to be one of the largest office buildings in the world.

Buffalo has 11 discount banks, 5 savings banks and 3 trust companies, the largest discount bank (the Marine National) having capital and surplus of \$10,000,000.

The Buffalo street railways were among the first to adopt electric traction and the system of free transfers. Numerous lines, the entire system covering 220.3 miles, furnish transit to all sections of the city and also to neighboring towns. An abundant water supply is derived from the lake and distributed by means of duplicate pumping stations, through 555 miles of water mains; and the sewerage system, comprising 523 miles of mains, not only covers the whole city, but has a large outfall sewer discharging into the swift current of Niagara River.

The park system of Buffalo includes over 1200 acres and consists of a chain of parks and parkways nearly encircling the city, and embraces a Forestry Bureau. The principal plots are the Front, of 45 acres, where the waters of the lake form themselves into the Niagara, and north of which is Fort Porter, a small military post; an adjacent stretch of water-front property, partly submerged and several acres in extent, for recreation piers and municipal docks; the Delaware Park, of 365 acres, adjoining which are the State Insane Hospital grounds, of 200 acres, and Forest Lawn Cemetery, of 230 acres; Humboldt Park, including about 56 acres, and three large parks in the south; Stony Point,

BUFFALOS



1. ASIATIC WATER BUFFALO (*Bos bubalus*).

2. AFRICAN BUFFALO (*Bos caffer*).

3. SAPI-UTAN (*Anoa depressicornis*).

on the lake shore; South Park; and Cazenovia Park. Besides these, and the connecting park boulevards and circles, there are minor spaces aggregating about 60 acres. The principal public monuments are the Soldiers' and Sailors' in Lafayette Square, the McKinley in Niagara Square, and those to Red Jacket and President Fillmore in Forest Lawn Cemetery.

Institutions. Besides its many churches of all denominations, and a large variety of charitable institutions, Buffalo is noted as the home of the first Charity Organization Society in the country (founded in 1877). Its new home on Franklin Street, made possible by a substantial bequest in the will of the late Mayor James Noble Adam, is the headquarters for a large amount of philanthropic work, prominent among which is the *crèche*, or day nursery for children whose mothers are at work, with its kindergarten and training school for nursery maids. Among other philanthropic institutions may be mentioned the Orphan Asylum, Home for the Friendless, St. Vincent's and St. Joseph's (Roman Catholic) orphanages, State Insane Asylum, Buffalo General Hospital, Municipal Hospital, Church Home for Aged Women, St. John's Orphan Home, St. Mary's Asylum for Widows and Foundlings, St. Mary's Institution for Deaf Mutes, Ingleside Home for Erring Women, Children's Hospital, and J. N. Adam Memorial Hospital at near-by Perrysburg, an institution for citizens suffering from incipient tuberculosis.

Educational institutions are numerous and efficient, one-fifth of the annual tax levy being allotted to the educational department of the city. In addition to the public schools, which include five high schools, vocational schools, a training school for teachers, and many kindergartens, there are a State Normal School, the University of Buffalo, St. Joseph's and Canisius' colleges (Roman Catholic), the German Martin Luther Seminary (Evangelical Lutheran), Academy of the Sacred Heart, Holy Angels' Academy, etc. Two municipal libraries, aggregating about 380,000 volumes, are supplemented by school and collegiate, and Historical Society, Society of Natural Sciences, Law (Eighth Judicial District), Erie Railroad, German Young Men's Association, Lutheran Young Men's Association, Merchants' Exchange, and Y. M. C. A. libraries. The Buffalo Library Building is occupied also by the Fine Arts Academy and the Society of Natural Sciences, both of which have interesting collections illustrating many subjects in their particular lines.

Commerce and Industry. Buffalo is one of the most marked of large American cities in its recent development, and owes its prosperity to commerce. Situated at the eastern end of the Great Lakes, where the vast inland commerce is transhipped by rail and canal to the seaboard, it occupies a strategic position commercially. Originally the only harbor was in the shallow water of Buffalo Creek. The United States government has constructed a series of breakwaters, one being 5 miles long (one of the longest in the world), forming both an inner and outer harbor. The State has constructed Erie Basin, at the terminus of the Erie Canal, and the city has deepened Buffalo Creek and constructed a ship canal to increase the wharf facilities. There is now a wharf frontage of 10 miles, with ample room for further extensions along Niagara River and along the lake. The government has also improved what is known as the Black Rock har-

bor, building an immense lock there for the benefit of boats to and from the Tonawandas down Niagara River. Altogether the Federal expenditures for harbor work amount to \$7,500,000.

Thirteen steamship lines make Buffalo their terminus; innumerable independent vessels ply to the chief ports on the Great Lakes, and there are several ferries to the Canada side, besides the International Bridge, completed at a cost of \$1,500,000. The city is connected with the tidewaters of the Hudson by the Erie Canal, and with ports on Lake Ontario and the St. Lawrence River by the Welland Canal, and is also the terminus or connecting point of a score of railroads. Among them are the Lake Shore and Michigan Southern; Michigan Central; Grand Trunk; New York Central; West Shore; Lackawanna; Wabash; Pennsylvania; Lehigh Valley; Buffalo, Rochester, and Pittsburgh; and New York, Chicago, and St. Louis. A belt-line railroad encircles the city, affording valuable facilities for intercommunication.

The commerce of Buffalo by these various means of transportation is very great. With a season of only about 246 days in the year, Buffalo ranks with the leading American and European ports in extent of traffic. In 1911 there were 3375 vessels cleared Buffalo harbor with a tonnage of 6,894,359 tons, and 3325 arrived with a tonnage of 6,862,798. The canal receipts in the same year were 579,646 tons, valued at \$12,965,609; shipments, 711,403 tons, valued at \$13,985,237. The 1912 grain receipts at Buffalo harbor were: wheat, 108,225,504 bushels; corn, 12,750,250 bushels; oats, 10,580,150 bushels; barley, 12,176,925 bushels; rye, 1,250,215 bushels; total, including more than 7,500,000 barrels of flour, 197,717,134 bushels. The immense quantity of flour and grain moved from the Western States to the seaboard constitutes the most important feature of its commerce; but live stock, lumber, and coal, iron ore, and fish, also, are of importance, the city's handling of wheat, flour, and coal, indeed, being the most extensive of any city in the world. Some part of the lumber and iron ore which arrive at this end of Lake Erie is received at Tonawanda (q.v.), a suburb to the north, on Niagara River, but Buffalo receives large quantities of each. Over 15,000,000 pounds of fish are received annually, mainly from Georgian Bay, and are distributed as far east as Boston and as far west as Denver. The horse market and sheep market of Buffalo are among the largest in the United States and in the trade in cattle and hogs Buffalo is also among the leading American cities. The material facilities for handling this enormous traffic form a most important feature of Buffalo. The first grain elevator in the world was built in Buffalo in 1843, and now there are more than a score of elevators, transfer towers, and floating elevators. These represent an investment of over \$13,000,000, can handle in one day 5,000,000 bushels of grain, and store at one time 22,000,000 bushels. The coal docks have a capacity of 29,000 tons a day, and on the eastern outskirts of the city are the enormous coal-stocking trestles, in which the railway companies keep their accumulated supply. The coal trestle of the Lackawanna Railroad is one of the largest in the country, being about a mile in length. In East Buffalo are the railroad stockyards, 75 acres in extent, affording transfer facilities for through freight, and salesyards for the local supply of live stock.

In addition to vast commercial activities, Buffalo's manufacturing interests are extensive and varied, the city's industries including about 58 per cent of all the different industries listed by the United States Census Bureau. In the production of foundry and machine-shop products, including stoves, nails, etc., and agricultural implements, the city ranks among the foremost, while it leads the world as a linseed-oil market; is one of the greatest copper and brass producing cities, and in the suburb of Lackawanna is the largest and most complete individual steel plant in the world, that of the Lackawanna Steel Company. Other industries are slaughtering and meat packing, refining petroleum, and shipbuilding; clothing, flouring and grist-mill products, brick, stone, lime, and stucco, malt and distilled liquors, soap and candles, starch, furniture, and tobacco and cigars are extensively produced. Besides these there are immense establishments manufacturing automobiles, saddlery and harness, cars, awnings, tents, sails, willow ware, carriages, wagons, cutlery, patent medicines, surgical appliances, etc. Power from Niagara Falls (q.v.) is used in Buffalo to a large extent, and the cheap and abundant supply from this source justifies the existence of 3000 manufacturing industries, employing 70,000 skilled workers.

The receipts for 1913 of the Buffalo post office amounted to \$2,217,394. There were more than 1,500,000 money-order transactions at the main office, amounting to \$26,865,643.

Government, Municipal Expenditures, etc. The government is vested in a mayor, elected every four years; a bicameral city council; and administrative departments, of which the health, fire, police, civil service, and park boards are appointed by the mayor; the city clerk, elected by the council; and all other municipal officials chosen by popular vote. The total number of city employees is about 6000. The per capita debt in 1912 was \$57.61; cost of government, \$31.58; receipts from revenue, \$28.23, all less than the general average of the United States and less than the average of cities of the same population group.

Buffalo spends annually, in maintenance and operation, about \$9,000,000, the main items of expense being about \$1,875,000 for schools, \$650,000 for interest on debt, \$941,000 for the police department, \$907,000 for the fire department, \$282,000 for parks and gardens, \$180,000 for street cleaning and sprinkling, \$371,000 for the water works, nearly as much for municipal lighting, \$155,000 for charitable institutions, \$220,000 for garbage removal, \$100,000 for libraries. The water works, which were built in 1868 at a total cost of over \$9,100,000, are owned and operated by the city, the entire water-works system now including about 555 miles of mains. During recent years great municipal activity has been displayed in the improvement of the water-supply service which, with recent additions, represents an outlay of more than \$12,000,000; in the laying of asphalt pavements; in the construction of natural-gas mains, facilitating the substitution of this fuel for coal; in the removal, in the business district, of overhead telephone and telegraph wires to subways, in which are carried also the fire-alarm and police wires of the city; in the establishment of the great public library (1897) and of municipal baths; and in harbor improvements supplemented by government expenditure.

A playground commission has control of nine playgrounds in different parts of the city. The city has entered also into a plan to abolish railroad grade crossings, mostly at the expense of the railroads. The city also has a Terminal Commission, authorized to deal with the railroad companies in the construction of freight and passenger terminals. Contracts have been made with the Lackawanna and the Lehigh Valley railroad companies providing for improved terminal facilities, including handsome new stations. Negotiations are in progress with the New York Central and other railroads. Buffalo has a bonded debt of over \$26,000,000, and the assessed valuation of property (real and personal) amounts to nearly \$332,700,000.

Population. Buffalo is one of America's most rapidly growing cities, as is shown by the following census figures: 1820, 2095; 1840, 18,213; 1860, 81,129; 1880, 155,134; 1890, 255,664; 1900, 352,387; 1910, 423,715; 1920, 506,775. During the decade 1890-1900 it rose in rank from eleventh to eighth place among the cities of the United States. The foreign born in 1900 numbered 104,000, and the native born of foreign parents numbered 160,000. The Germans constituted over two-fifths of the total foreign born, the principal other nationalities represented being the Canadian, Irish, Poles, Italians, and English. More than 50 per cent of Buffalo's population is of foreign parentage. The city's birth rate for 1912 was 26.05 per 1000 of population, and its death rate was 14.67, including all deaths occurring in the city, whether of inhabitants or otherwise.

History. In 1679 La Salle visited this locality, and built near the present city the first ship that was navigated on Lake Erie—a little vessel of only 60 tons, called the *Griffin*. In 1792 there was only one settler here, a trader named Winney, and in 1795, according to the French traveler, Liancourt, there was only "a small collection of four or five houses." In 1792-93 the Holland Land Company, so called, bought a large tract of land in this vicinity, which during 1798-1803 was laid out into townships by Joseph Ellicott. Influenced by Ellicott, commonly called the "founder of Buffalo," the proprietors decided, in 1801, to establish a town (New Amsterdam) at the mouth of Buffalo Creek, and in 1803-04 a village was laid out under Ellicott's supervision. Though legally New Amsterdam, this new village soon came to be called Buffalo, probably from the immense herds of bison which had formerly frequented the salt licks several miles away, and in 1810 the township of Buffalo, with limits including the present city, was incorporated. In 1811 the first newspaper, the *Buffalo Gazette*, was published, and in 1818 the first steamboat, *Walk-in-the-Water*, was built. On Dec. 29, 1813, a British and Indian force of 1200 men, under General Riall, captured Buffalo, and on the 30th and January 1st almost completely destroyed it by fire. In 1815 it was rebuilt, but its growth was very slow until after the completion of the Erie Canal in 1825, when it became a distributing centre between the East and the West. In 1832, with a population of 15,000, it became a city, and since 1857 it has been noted for its manufactures and commerce. In 1853 Black Rock, which for many years was Buffalo's great rival, was brought within the city limits. Buffalo was the home for a time of Millard Fillmore and Grover Cleveland, the latter serving as mayor

in 1882. In 1901 (May 1 to November 1) the Pan-American Exposition was held at Buffalo. At this exhibition occurred the assassination of President McKinley, on Friday, Sept. 6, 1901. See PAN-AMERICAN EXPOSITION.

Consult: Smith, *History of the City of Buffalo and Erie County* (Syracuse, 1884); Ketchum, *An Authentic and Comprehensive History of Buffalo* (Buffalo, 1864-65); Powell, *Historic Towns of the Middle States* (New York, 1899); Severance, *Picture Book of Earlier Buffalo* (Buffalo, 1913).

BUFFALO. A town and the county seat of Johnson Co., Wyo., 32 miles (direct) southeast of Sheridan (Map: Wyoming, E 1). The people are engaged principally in agriculture and stock raising. Buffalo is the seat of a State Soldiers' and Sailors' Home and has a Carnegie library, courthouse, and county high school, and owns its water works and sewer system. Pop., 1890, 1087; 1900, 710; 1910, 1368.

BUFFALO BERRY (*Shepherdia argentea*). While familiar to horticulturists for many years, the buffalo berry has but recently taken rank as a fruit plant. It is a native of the cold, dry northwestern part of North America, where it has achieved its greatest success under cultivation. The buffalo berry is a shrub with small silvery leaves, short thorny spines or branches, upon which the fruits, of about the size of a common currant, are borne. The plant is dioecious, consequently both male and female forms must be planted in order to insure fruit production. The two forms are easily recognized by the form and distribution of the winter buds; the staminate or male plant bears small rounded buds in dense clusters scattered all along the spurs; the pistillate, or female plant, bears fewer and more elongated buds, usually in pairs along the sides of the spurs. The fruits are either red or yellow, are used for jellies, and often serve instead of currants for this purpose. There are no cultivated varieties on the market. The plant is valuable as an ornamental shrub. See ELEAGNUS.

BUFFALO BILL. See CONY, WILLIAM F.

BUFFALO BIRD. A bird closely associated with wild oxen or buffaloes, picking the parasites from their hides to eat, and warning the animal of possible danger by the expression of its own alarm. 1. An ospecker (q.v.). 2. A tick bird. See TICK.

BUFFALO FISH. One of several suckers (Catastomidae) of the Mississippi valley, comprised in the genus *Bubalichthys* or *Ictiobus*, and so called because of the humped outline of the back, the large head, and dark colors. The red-mouthed buffalo fish (*Ictiobus cyprinella*) is brownish olive and reaches a length of nearly 3 feet and a weight of 20 to 30 pounds. The big-mouthed one (*Ictiobus urus*) is also large and very dark, with all the fins black; while the small-mouthed (*Ictiobus bubalus altus*) is paler and more southerly in its habitat. The flesh is poor. For illustration see PLATE of SUCKERS. See also FISHERIES.

BUFFALO GNAT. A gnat of the genus *Simulium*, closely related, and similar to the northern black fly (q.v.), which swarms in the valleys of the Mississippi and Missouri rivers. "They rival the mosquito in their bloodthirsty tendencies," says Howard, "and not only do they attack human beings, but poultry and domestic animals are frequently killed by them. . . ." In certain seasons they multiply enormously, alight

on cattle (as formerly they did on the bison), and produce death through their poisonous bites as well as from loss of blood. Unlike mosquitoes, they fly and bite in the daytime and are often seen in large numbers flying in bright sunshine. The larvae are aquatic, and unlike mosquitoes again, the larvae of which live in stagnant water, *Simulium* larvae frequent well-aerated and frequently swiftly running streams. Consult: *Bul.* 5, *Div. Entom.*, U. S. Dept. Agriculture; Osborn, "Insects Affecting Domestic Animals," *Dept. Agric.* (Washington, 1896).

BUFFALO GRASS, or BUCHLOË (*Buchloë* or *Bulbilis, dactyloides*). A common grass of the western United States, ranging from Manitoba to Texas, where it is one of the best pasture grasses. It is a low, spreading grass seldom more than 6 inches in height. It spreads rapidly by runners, soon forming a dense sod. The grass is dioecious, the male flowers conspicuous, while the female flowers, which occur on a different plant, are easily overlooked. It is readily propagated by seed or sod and is improved by cultivation. Sod transplanted from the plains to Washington, D. C., quickly covered the ground and is perfectly adapted to its surroundings. It turns brown after frost, but during the summer presents a dense growth of fine herbage. It is apparently very nutritious and is relished by all kinds of stock.

BUFFALO MOTH. See CARPET BEETLE.

BUFFALO NUT. See TRAPA.

BUFFER (OE. *buffe*, slap, blow), **BUFFING APPARATUS.** An arrangement projecting from the frame of a railway car to prevent injury from violent contact or collision, or to deaden the effect of the concussions caused when the velocity of a part of the train is checked or when the engine is starting the train. Buffers are used on passenger cars in America and consist of three parts—the head, the bar, and the stem. The stem passes through the spring and buffer-spring beam; the shoulder formed by the junction of the stem with the bar bears directly, or by means of a plate, against the spring, which is usually of the volute or spiral type. This buffer is placed at the centre of each end of the car. In English railway practice two buffers are used at each end of the car, one at each side of the centre. The general construction is much the same as that described above, except that flat springs, somewhat like a carriage spring, are employed.

BUFFET, by'fä', LOUIS JOSEPH (1818-98). A French politician. He was born at Mirecourt, Vosges, and in 1848 entered the Chamber of Deputies. Under the presidency of Louis Napoleon he held the portfolio of Commerce and Agriculture. He afterward became leader of a "Tiers Parti," which tried to reconcile liberal reforms with loyalty to the government, and in January, 1870, joined M. Emile Ollivier's cabinet as Finance Minister, but resigned in April. He was elected to the National Assembly (1871), of which he became president in 1872, and formed a cabinet in 1875, taking the portfolio of the Interior. In this latter office, however, he made himself obnoxious to the Republican party, and when, in 1876, he failed to secure a reelection to the Assembly, he resigned. During the same year (1876) the Senate elected him a life member.

BUFFINGTON, ADELBERT RINALDO (1837-1922). An American soldier. He was born at Wheeling, W. Va., and graduated at West Point in 1861. He was brevetted major in 1865, and was commander successively of the United States

ordnance depot at Wheeling, W. Va., and of the arsenals in New York, Baton Rouge, Watertown, Mass., Watervliet, Indianapolis, Pittsburgh, Springfield, Mass., and Rock Island. In 1899 he was appointed chief of ordnance and was raised to the rank of brigadier general. In 1901 he was retired. He invented a magazine firearm, a "rod bayonet," and a rear sight for military firearms. Many other improvements in firearms were introduced by him.

BUFF LEATHER. A leather made out of salted and dried South American light oxhides and cowhides. Buff leather is a split side leather, coarser than what is known as glove grain, and is used for the cheaper grades of men's shoes. It is very pliant, is not liable to crack or rot. The natural color of the leather is light yellow, but it is sometimes bleached white. It was formerly tanned soft and white and used for armor.

BUFFLEHEAD (from Fr. *buffle*, buffalo; referring to the size of its head). A fresh-water duck (*Charitonetta albeola*) of North America, so named from the apparent bigness of the head, due to the elongated feathers. It is also called "butterball," for its fatness, and "dipper" and "spirit duck," from its amazing skill in vanishing and reappearing. The body colors of the drake are black and white, with the crested head "rich, silky, dark metallic green, bronze, and violet purple," with a patch of white behind the eye. The female is dusky brown, with white markings. The length is about 13 inches. This small and beautiful duck frequents inland waters, especially deep lakes, on its spring and fall migrations, and is a favorite with sportsmen, but not common, and hard to get. It breeds from the Great Lakes and New Brunswick northward to the Arctic Circle, in holes in trees, or, in the absence of trees, in gopher burrows and similar holes in banks, and lays about 12 eggs, larger and darker than those of a teal. See Plate of DUCKS, AMERICAN WILD.

BUFFON, by'fon', GEORGE LOUIS LECLERC, COMTE DE (1707-88). A French naturalist and philosopher. He was born in Montbard, Sept. 7, 1707, and died in Paris, April 16, 1788. He received a liberal education and traveled in Italy and England. His father was an eminent lawyer and wished his son to follow his profession; but the boy evinced a stronger liking for the sciences and devoted all his earlier life to studies in mathematics, physics, and agriculture. In 1739 he was elected a member of the Academy of Sciences and also appointed keeper of the Royal Gardens and Museum in Paris, out of which were subsequently formed the Jardin des Plantes and the Museum of Natural History. Here he lived for several months of each year, in a large house, which is still standing, and which after his death became successively the lodging place of many famous naturalists. The remainder of the time he lived in the rural village of Montbard, where, and not in the presence of the specimens in the museum in Paris, his *Natural History* was written. His position, personal influence, and wealth enabled him to be of great service to several students who became eminent investigators, the most important of whom was Lamarck. Buffon himself was never an investigator nor even an observer. He was a compiler and popularizer of scientific matters, which he presented in an attractive, even brilliant, way, and upon which he framed theories and generalizations, some of which were notable as fore-

shadowing the evolutionary notions of the succeeding generation. "His single positive addition to zoological science," says Packard, "was generalizations on the geographical distribution of animals." His elaborate and picturesque theories in respect to the geological history of the earth were erroneous and fantastic, yet had the virtue, as was pointed out by Cuvier, of calling attention clearly to the fact that the history of life upon the globe was the history of a succession of advancing changes. Soon after taking charge of the museum he began the great work upon natural history, *Histoire naturelle, générale et particulière* (44 vols., quarto, Paris, 1749-1804), with which his name is most commonly associated, and which was completed by Lacépède after his death. It passed through several editions and was the first work which brought together the information of the time in a manner interesting and intelligible to the general reader, illustrated by really good pictures.

Scattered through this work are passages of speculation and suggestion, which seem accidentally thrown out rather than carefully considered, and which are often so tinged with irony as to make it difficult for the modern critic to determine whether their author really believed what he said—an effect in part due, no doubt, to the danger of uttering new ideas in the political and social atmosphere of his time. Some of these suggestions seem definitely to anticipate the evolutionary ideas of Lamarck and the two Darwins, and to assert the mutability of species, but they are rarely complete in statement. He seems to have been most impressed with the influence of climate as a factor compelling variation in animals and species, and hints that thus many species in the past may have been extinguished or created. He even asserts, in a hypothetical way, the idea of the derivation of species by descent and variation from earlier forms, but follows it by a denial. Dr. A. S. Packard, who collected all the views of Buffon bearing upon biological evolution, as the term is now understood, concludes an examination of them as follows: "The tentative views of Buffon . . . would now be regarded as in a degree superficial and valueless. But they appeared 34 years before Lamarck's theory, and, though not epoch-making, they are such as will render Buffon's name memorable for all time."

Buffon was admitted to the French Academy in 1753, when he delivered as his inaugural address the famous *Discours sur le style*. He was also perpetual treasurer of the Academy of Sciences, fellow of the Royal Society of London, and member of all the prominent scientific societies of Europe. He married in 1752, and his son became an officer of the French army and was executed in 1793 for political reasons. Consult: Flourens, *Histoire des travaux et des idées de Buffon* (Paris, 1844); Packard, *Lamarck* (New York, 1901); Hémon, *Buffon* (Paris, 1901); Sauter, *Herder und Buffon* (Basel, 1910).

BUFFOON (Fr. *buffon*, It. *buffone*, from *buffa*, jest, *buffare*, to puff, buff, blow). A low jester. The Italian *buffo* (from *buffa*, a farce) is the name given to a comic singer in an opera. In the corrupt Latinity of the Middle Ages *buffa* meant 'a slap on the cheek'; and in the Italian *buffare* signifies 'the puffing of wind through the mouth.' It is probably from the favorite trick played by clowns in farces—one swelling out his cheeks with wind, the other slapping them, so as to make a ludicrous explosion—that the terms

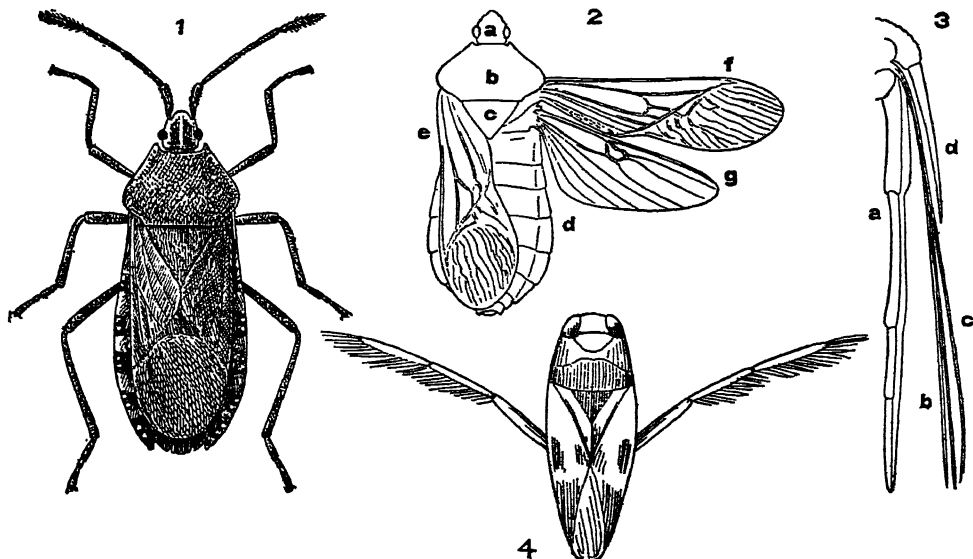
buffones in Latin, *buffoni* in Italian, *bouffons* in French, and in English *buffoon*, were derived. In Italy the *buffo cantante* is distinct from the *buffo comico*; the former having greater musical talent and sustaining a more important part, the latter having greater license in jocoseness. The voice of a *buffo cantante* is generally a bass, but sometimes a tenor buffo is introduced.

BUFORD, JOHN (1826-63). An American cavalry leader on the Federal side in the Civil War. He was born in Woodford Co., Ky.; graduated at West Point in 1848; was assigned to garrison duty in the West; participated, as first lieutenant, in the Sioux expedition of 1855 and in the Utah expedition of 1857-58; and from 1859 to 1861 was stationed at Fort Crittendon, Utah. In November, 1861, he was appointed assistant inspector general with the rank of major, and in July, 1862, after having served for several months in the defenses at Washington, was raised to the rank of brigadier general of volunteers. He was then placed in command of a cavalry brigade in the Army of Virginia, took part in General Hooker's campaign of 1862, and was wounded in the second battle of Bull Run. In McClellan's Maryland campaign he served as chief of cavalry in the Army of the Potomac and was in the battles of South Mountain and Antietam, replacing Stoneman on McClellan's staff after the latter. Soon afterward, upon the reorganization of the cavalry by Burnside, Buford was placed in command of the Reserve Cavalry Brigade and in this capacity participated in the battle of Fredericksburg, in the famous Stoneman's Raid, and in the spirited cavalry engagements at Brandy Station. He then served under Meade in the Pennsylvania campaign, was engaged in numerous cavalry skirmishes, and displayed remarkable gallantry in the battle of Gettysburg, which he began, before the arrival of Reynolds, on July 1. By many he is credited with having deliberately chosen the field on which this great battle was fought and with

having so manœuvred as to bring Meade and Lee together here. Thus the Comte de Paris says, "It was Buford who selected the battle field where the two armies were about to measure their strength" (*History of the Civil War in America*, vol. iii, p. 545). Buford pursued the Confederates to Warrenton and was afterward engaged in many operations in central Virginia, rendering a particularly valuable service in covering Meade's retrograde movement to Bull Run in October, 1863. He withdrew on sick leave in November, and on December 16 died in Washington, receiving a commission as major general on the day of his death. A monument was erected to his memory on the Gettysburg battle field in 1895. Consult a biographical sketch in *Proceedings of the Buford Memorial Association* (New York, 1895).

BUFORD, NAPOLEON BONAPARTE (1807-83). An American soldier. He was born in Kentucky, and graduated at West Point in 1827. He then studied law at Harvard, was assistant professor at West Point, and in 1835 resigned from the service to become an engineer. He afterward engaged in iron manufacturing and banking at Peoria, Ill., and became president of the Rock Island and Peoria Railroad. In the Civil War he was first a colonel of volunteers and then a brigadier general, took part in the sieges of Corinth and Vicksburg, and in 1865 was brevetted major general of volunteers. General Buford was government inspector of the Union Pacific Railroad from 1867 to 1869 and a special commissioner of Indian affairs in 1867-68.

BUG (Welsh *bug*, spectre, Corn. *bucca*, bugbear; cf. Lith. *baugus*, terrific). The common name applied to the various members of the order Hemiptera (Gk. *ἥμι-, hēmi-*, half + *πτερόν, pteron*, wing), so named because the basal half of the wing in many of the forms is thickened like the wing covers of beetles, while the distal half is membranous and winglike. The mouth parts are in the form of a beak, and are



TYPICAL BUGS AND STRUCTURE.

1. Adult squash bug (*Anasa armigera*). 2. Principal features of a typical bug: a, head; b, prothorax; c, scutellum of mesothorax; d, segments of abdomen; e, left wings folded over the back (position of rest); f, g, right wings extended (as in flight). 3. Mouth parts of the squash bug: a, labium; b, maxillae, so close together as to appear as one; c, mandibles; d, upper lip. 4. An aquatic bug (*Notonecta*), showing third pair of feet modified into oars.

fitted for piercing and sucking. Nearly all bugs subsist on the juices of plants, a few partake of animal juices alone, and several of both animal and vegetable fluids; hence, economically, the order is very injurious. A few forms are predaceous and hence helpful. Certain others, such as the cochineal and lac-dye insects, and their secretions, such as china wax and shellac, are articles of considerable commercial importance. Many bugs secrete a substance characteristically pungent, penetrating, and often having disagreeable smell and taste. The metamorphosis of bugs is incomplete, i.e., they do not transform completely at once; and the parasitic forms are wingless. Some of the species are very large, certain aquatic ones reaching a length of 12 centimeters. A loathsome, long-known, and widespread pest of man is the bedbug (q.v.). In Chile a very large bug hides in the thatch of houses and, like the bedbug, comes out at night to suck blood. In England there is found on the birch tree a bug that has the rare habit among insects of caring for its young. Among all the bugs injurious to agriculture, the chinch-bug (q.v.) (*Blissus leucopterus*) ranks first in the United States; and it is in the Mississippi valley that it does the most harm, destroying entire crops of wheat, oats, and Indian corn, especially during dry, warm summers.

The squash bugs destroy squash and pumpkin vines. Other bugs feed on cabbage, radishes, and turnips. The true lice, both of man and beast, are bugs; so also are the cicadas, which include the seventeen-year locust. Certain plant-sucking bugs cover themselves in their immature stages with a mass of foam, which is commonly known as "frog spittle." To the bugs belong the aphids, plant lice which prey on the root, stem, or leaf of all sorts of plants. Closely related to the latter are the scaly bugs so common on the oleander, lemon, and orange. Indeed, were it not for the many insect and larger foes of bugs, as well as for the fungus and other diseases they are subjected to, vegetation could not possibly exist. Consult, for further particulars, the special articles under the names above mentioned.

BUG, bōōg. Two rivers of Russia. 1. Also called the Western Don, a tributary of the Vistula. It rises in Galicia, Austria-Hungary, and, entering Russia, flows at first north, along the eastern borders of Poland, and then west, and joins the Vistula at the fortress of Novo Georgievsk, after a course of over 470 miles (Map: Russia, B 4). It is navigable for over 300 miles and is of great importance to the lumber trade of Russia. It is connected by canals with the Dnieper and the Niemen. 2. The ancient *Hypanis*, or *Bogus*, whence the name. It rises in the southern part of Volhynia, and flows in a southeasterly direction through the governments of Podolia and Kherson, emptying into the Black Sea near Nikolayev, where it forms a wide estuary connected with the Dnieper Liman (Map: Russia, D 5). Its length is 470 miles, and it is navigable for small craft as far as Voznesensk, while larger steamers can ascend only to Nikolayev. Its chief tributary is the Ingul.

BUGASON, bōō'gá-sōn'. A town of Panay, Philippines, in the Province of Antique. It is situated on the coast, 24 miles north of San José de Buenavista. Bugason was founded in 1700. Pop., 1903, 11,101.

BUGBANE. See CIMICIFUGA.

BUGEAUD DE LA PICONNERIE, bŭ'zhō'

de lá pé'kón'ré', THOMAS ROBERT, DUC D'ISLY (1784-1849). A French marshal. He was born in Limoges, Department of Haute-Vienne, France, and in his twentieth year entered the army as a private. His conspicuous bravery in the Prussian, Polish, and Spanish campaigns gained him rapid promotion. Shortly before the fall of Napoleon Bugeaud was made a colonel, and in 1815 commanded the advance guard of the army corps of the Alps. He afterward retired to his estates, but was called into public life by the July Revolution of 1830. He was elected deputy for Périgueux in 1831 and gained the esteem of Louis Philippe. In 1834 he put down an insurrection in the streets of Paris. The next year he voted against electoral reforms and universal suffrage, denounced the "tyranny of the press," and soon contrived to make himself very unpopular. In 1840 he was appointed Governor-General of Algeria. He immediately set about organizing the celebrated irregular force known as the Zouaves, and in a few years the French arms were everywhere triumphant over the Arab tribes. The cruelty of some of Bugeaud's proceedings excited strong feelings of reprobation at the time in France and in Europe generally. In 1844 he gained a victory over the Emperor of Morocco's forces at Isly, for which he was created a marshal of France and received the title of Duc d'Isly. At the outbreak of the Revolution of February, 1848, Marshal Bugeaud received the command of the army in Paris, but, having counseled the strictest measures in order to quell the outbreak, he was dismissed by the frightened King the following day (February 24). When Louis Napoleon became President, he intrusted the chief command of the Army of the Alps to Bugeaud, but he soon after died of the cholera in Paris. He left behind him his *Mémoires*, which were translated into English in 1882.

BUGENHAGEN, bōō'gen-hä'gen, JOHANN, surnamed POMERANUS, or DE. POMMER (1485-1558). A German reformer. He was born at Wollin, near Stettin, in Pomerania, June 24, 1485. He studied at Greifswald, and as early as 1504 became rector of the academy at Trep-tow; became a priest in 1509, but did not give up his school, which greatly prospered under him. There he lived quietly, fulfilling the duties of his office until 1520, when his religious views were changed by reading Luther's little book *De Captivitate Babylonica*. Bugenhagen was now seized, as it were, by the zealous spirit of the Reformation, and, to avoid the persecutions of the Old Church party, he betook himself to Wittenberg, where he matriculated (1521), and where his talents procured for him in succession several high positions. Bugenhagen's remarkable philological and exegetical powers were of great service to Luther in his translation of the Bible. In 1525 he opened the controversy between Luther and Zwingli by a treatise against the latter, to which Zwingli ably replied. He possessed a remarkable talent for organization, establishing churches in Brunswick, Hamburg, Lübeck, and in Pomerania. In 1537 he was called to Denmark by Christian III to reform the ecclesiastical establishment of that country. He accomplished this so admirably that the Danes to this day consider him their own reformer. In 1542 he returned to Wittenberg and continued his energetic efforts to extend the new theology throughout his native land. He died there, April 20, 1558. His best work is his *Interpretatio in Librum Psalmorum* (1523), but

his works have not been collected. Letters of his were published by O. Vogt in Stettin, 1888; additional ones in 1890; but many still exist unprinted. For his life, consult: C. A. T. Vogt (Elberfeld, 1867), with selections from his writings; H. Hering (Halle, 1888), and Gorigk (1895). Consult also Lindsay, *History of the Reformation*, vol. i (New York, 1906).

BUGGE, bug'ge [ELSEVUS] SOPHUS (1833-1907). A Norwegian philologist. He was born at Laurvig, and was educated at the universities of Christiania, Copenhagen, and Berlin. In 1866 he became the first professor of comparative philology and of the Old Norse language at Christiania, a chair which was founded by the Storting. His principal work is an edition of the songs of the Edda, which he published under the title *Norroen Fornkvæði* (1867), and which supplanted all previous editions. Bugge is the leading authority on Northern languages. Some of his works on this and kindred subjects are: *Gamle norske Folkeviser* (1858); *Norroene Skrifter af sagnhistorisk Indhold* (1864-73); a splendid edition of the *Völsunga* and *Hervarar* sagas; *Tollking af Runeindskriften paa Rökstenen i Oestergötland* (in *Antiquarisk Tidskrift för Sverige*, vol. v); *Norsk Sagafortælling og Sagaskrivning i Island* (1901). An English translation of one of his works was published under the title *The Home of the Eddic Poems* (London, 1899). Bugge was a very versatile scholar. Besides his work on the Scandinavian and Germanic languages, he made valuable contributions to the study of the Romance, Celtic, Oscan, Umbrian, and Etruscan languages.

BUGIARDINI, bōō'jār-dē'nē, GIULIANO (1475-1554). A Florentine painter of the Renaissance. He was born in Florence and studied in the studios of Ghirlandajo and Bertoldo, where his lifelong friendship with Michelangelo began. Ghirlandajo, Albertinelli, Fra Bartolommeo, Raphael, Michelangelo, and Leonardo in turn exerted a strong influence upon him, and he knew how to assimilate their ideals so well that his pictures have repeatedly been ascribed to them. In 1508 Michelangelo is said to have summoned him to Rome to assist him in the Sistine Chapel. His favorite theme is the Madonna. "The Madonna and Child with St. John" in the Uffizi, Florence; "The Martyrdom of St. Catharine" in Santa Maria Novella, Florence; "The Marriage of St. Catharine" and "John the Baptist in the Desert," in Bologna, and a portrait of Michelangelo in the Casa Buonarroti, are among his principal works. The Metropolitan Museum of New York possesses a characteristic Madonna by him.

BUGIS, bōō'jēz. The natives of the country of Boni, in southwestern Celebes, whose state once held sway over a large portion of the island. They belong physically to the lighter and more attractive Malay type, and their language is closely related to that of their neighbors, the Macassars; but they have an alphabet and a literature of their own. They profess the religion of Islam. The Bugis are much devoted to the arts of peace, and as traders and seamen they are found all over the archipelago, from Malacca to New Guinea. In Perak, Borneo, etc., their colonies are quite numerous and large. Their governmental institutions seem to have been more liberal and their folk life more advanced than those of the other peoples of Celebes. Socially and morally they rank with the best of the Malays and have a reputation for

honesty, in spite of the unprepossessing looks of many of the sailor sort. Of recent literature may be mentioned P. B. van Staden ten Brink, *Zuid Celebes* (1884). See CELEBES.

BUGLE, bū'gl (Fr., from Late Lat. *bugillo*, a plant), or **BUGLEWEED**. *Ajuga*, a genus of hardy herbaceous plants of the family Labiata, having an irregular corolla, with very short upper lip and trifid lower lip and protruding stamens. The species are mostly natives of the colder parts of the Old World, and several are British. The common bugleweed (*Ajuga reptans*) is abundant in moist pastures and woods. Its flowers are generally blue, but varieties occur with white and purplish flowers, which are often introduced into flower borders. The alpine form is one of the beautiful flowers of the Swiss Alps.

BUGLE (origin obscure). A musical wind instrument of brass or copper, used mostly as a signal instrument in military evolutions. The bugle is made in three pitches, Bb, C, Eb, and has seven harmonic tones. Between 1815 and 1835 its power and range were increased by the additions of sound holes and keys; and, upon the introduction of valves, from the bugle were formed the tuba (q.v.) and saxhorn (q.v.). See **BAND**; **WIND INSTRUMENTS**.

BUGLE and TRUMPET CALLS. Military signals sounded by trumpet or bugle to notify troops of an order to be executed. The use of trumpets, as all earlier forms of bugles and trumpets were called, dates from the very earliest times, and the primary purpose of the historic ram's-horn and the modern bugle were practically identical. Changes in military conditions and tactics have only served to invest the bugle with increased importance. Indeed, the scattered disposition of troops in modern battle formations, the necessity for extended intervals in even the smallest command, together with the practical hiding of many of the details under cover, make the modern bugler or trumpeter more necessarily the mouthpiece of the officer to-day than at any previous period of military history. The bugle possesses an added importance in the moral support and strenuous encouragement which results from its strident tones. In times of peace the uses of the bugle are far more manifold and scarcely less important. From the sounding of reveille, that summons the troops from slumber, to the last note of taps, the routine life of the army post is punctuated by the notes of the bugle or trumpet calling the men to their various duties, drills, and parades. In the United States army the chief trumpeter ranks next below battalion or squadron sergeant majors, while in England he is described as bugle or trumpet major, and ranks as next junior to the color sergeants in infantry, or troop sergeant majors in cavalry—an equivalent rank to first sergeant in the United States army. Another custom, as universal as the use of the bugle, is to furnish officers and a proportion of noncommissioned officers with whistles, by which means orders can be given and men controlled on occasions when a trumpet would be unwise or impossible. In the United States army the quartermaster's department is ordered to supply to each field battery two small brass Bb bugles, and to every other company two G trumpets with F slides or detachable F crooks.

Bugle or trumpet calls may be grouped under four general headings, as, warning calls, forma-

tion calls, alarm calls, and service calls. The "calls" that follow are taken from the *Infantry Drill Regulations*, United States army. A prominent feature of this code is the excellent manner of arrangement, by which the memorizing of the calls is much facilitated. For instance, all movements to the right are on the ascending chord; the corresponding movements to the left are corresponding signals on the descending chord; and the changes of gait all upon the same note.

The music here reproduced is written an octave higher than the trumpet scale, and is adjusted to the scale of the bugle.

*Quick.***Reveille.***Moderate.***Assembly.***Quick.***Boots and Saddles.***Quick time.***To the Color.***End.**Moderate.***Retreat.***Slow.***Taps.**

For further information, consult Littleton, *Trumpeter's Hand-Book and Instructor* (Kansas City, 1902).

BUGLEWEED. See BUGLE.

BUGLOSS (Fr. *buglosse*, Lat. *buglossa*, from Gk. *βοῦς*, *bous*, ox + *γλῶσσα*, *glōssa*, tongue). A name popularly applied to many plants of the family Boraginaceæ, as to the species of *Anchusa* or alkanet (q.v.), etc. In some regions the

name is confined to the genus *Lycopsis*, which differs from *Anchusa* in the curiously curved tube of the corolla, and of which one species (*Lycopsis arvensis*) is a common weed in grain fields in Great Britain. The beautiful genus *Echium* is called "viper's bugloss." See **VIPER'S BUGLOSS**.

BU'GONG. A food prepared by the native Australians from a butterfly of the genus *Danaï*. See **DANAÏ**.

BUGURUSLAN, bōō'gōō-rōō-slān'. A district town in the Government of Samara, Russia, on the river Kinel, 178 miles northeast of Samara (Map: Russia, H 4). It contains a monastery, and the chief occupations of its inhabitants are farming and gardening. There is some trade in local products. Pop., 1897, 12,141, including about 1200 Mohammedans. The town was founded in 1748.

BU'HACH. See **FLEABANE**.

BU HAMARA, bōō hā'mā-rā. A modern pretender to the throne of Morocco (q.v.).

BÜHELER, bŭ'lēr, HANS DER or HANS VON BÜHEL. A Mediæval German poet of the fifteenth century. He was born in Alsace, and at the beginning of the fifteenth century was in the service of Frederick III of Saarwerden, Archbishop of Cologne. His two principal poetic productions, both of which are based upon popular romances, are respectively entitled *Die Königstochter von Frankreich* (1400) (edited by Merzdorf, 1867) and *Diocletians Leben* (1412) (edited by Keller, 1841). Consult Seelig, *Strassburger Studien*, vol. iii, p. 243; and Behagel, *Germania*, vol. xxxvi, p. 241.

BUHI, bōō-ē'. A town of Luzon, Philippines, in the Province of Ambos Camarines, on Lake Bui, 29 miles by highway southeast of Nueva Cáceres. Pop., 1903, 9692.

BUHL, bōōl, FRANTS (1850-). A Danish philologist, born at Copenhagen. He was educated at the Metropolitan School and later studied theology and specialized in the study of Arabic and Oriental languages. In 1880 he became lecturer, and in 1890 professor of Old Testament theology, at the University of Leipzig. In 1898 he returned to Copenhagen as professor of Semitic and Eastern philology, and in 1911-12 he was university rector. His works include: *Den gammeltestamentlige Skrift-overlevering* (1885); *Jerusalem paa Christi og Apostlenes Tid* (1886); *Fortolkning til Jesaja* (1889-94); *Palæstina* (1890); *Det israelittiske Folks Historie* (1893); *Psalmerne oversatte og fortolkede* (1900); *Muhammeds Liv* (1903).

BUHL, LUDWIG VON (1816-80). A German physiologist, born in Munich. He did much work in physical diagnosis, pathological anatomy, and microscopy. In 1850 he became professor of general pathology and pathological anatomy at the University of Munich, and in 1875 was appointed director in the pathological institute in that city. His most important work is the treatise entitled *Lungenentzündung, Tuberkulose und Schwindsucht* (1872; 2d ed., 1874).

BÜHLER, bŭ'lēr, JOHANN GEORG (1837-98). A German-British Sanskrit scholar and Indologist, born at Borstel, in the Kingdom of Hanover, July 19, 1837. He studied in Göttingen, Paris, and London, and in 1863 he was appointed professor of Oriental languages at Elphinstone College, Bombay. During the years of his stay in India he took an active part in the work of the

Department of Public Instruction in the Bombay Presidency. His zeal at the same time in searching for manuscripts and gathering material in Gujarat, Rajputana, Kashmir, and in Central India, yielded rich fruits for the history of ancient Hindu literature. With a colleague, he founded the valuable *Bombay Sanskrit Series* in 1868, and he collaborated with Sir Raymond West in a *Digest of Hindu Law* (1867-84). Other publications on the Indian law books, such as the *Sacred Laws of the Aryas*, and the *Laws of Manu*, appeared from his pen in Max Müller's series of *Sacred Books of the East* (Oxford, 1879-86). In 1871 he began the publication of his *Catalogue of Sanskrit MSS.*, contained in the private libraries of Gujarat, etc., which he completed in 1873 (Bombay). In 1880 Bühler returned from India to take the chair of Sanskrit and Indology at the University of Vienna. He joined with his colleagues of the Vienna Oriental Institute in establishing the *Wiener Zeitschrift für die Kunde des Morgenlandes* (1887 et seq.). Still more important was his founding the *Grundriss der indo-arischen Philologie und Alterthumskunde* (Strassburg, 1896 et seq.), upon which he was still engaged at the time of his sudden death by drowning in Lake Constance, April 8, 1898. The editorial work upon this monumental publication has since been carried on by Kielhorn. Bühler's name was authoritative in almost every branch of Indian philology, archaeology, and religion; but perhaps most important are his works on Indian epigraphy. His *Indische Palæographie* (Strassburg, 1896) was translated into English by J. F. Fleet (Bombay, 1904). Consult: for his biography, and bibliography, Jolly, *George Bühler* (Strassburg, 1897); *Indian Antiquary* (Bombay, 1872 et seq.); and the *Grundriss*, or *Encyclopædia of Indo-Aryan Research*.

BUHL'WORK. See **BOULLE**.

BUHRSTONE, bēr'stōn', or **BURRSTONE** (*bur* + *stone*, referring to its *bur*, or rough surface). A siliceous rock, containing many small empty cells, which give it a porous texture. The quartz of which the rock is composed represents an amorphous form of silica that has been deposited either chemically from solution or through the action of certain low forms of organisms. Buhrstone is used for making millstones, the presence of the pores preventing its wearing smooth. It is found chiefly in the Eocene period of the Tertiary, in France, Belgium, Wales, Scotland, and Alabama. The French buhrstone commands the highest price and is exported to the United States. There are different varieties of buhrstone, which vary in respect of the size, frequency, and manner of distribution of the cells. It is not unusual to form millstones of wedge-shaped pieces of buhrstone bound together by iron hoops. The stone is found in beds or in detached masses, and the mode of quarrying is peculiar. When the mass is large, it is cut into the form of a huge cylinder; around this grooves are cut, at distances of about 18 inches, the intended thickness of the millstones; into these grooves wooden wedges are driven and water is thrown upon the wedges, causing the wood to swell and thus to split the cylinder into the required sections.

The term "buhrstone" is commonly applied also to sandstone or conglomerate that is adapted for millstones. The German buhrstone is a variety of cellular basalt. See **MILLSTONE**; **ABRASIVES**; **TERTIARY SYSTEM**.

BUIL, bwel, BERNARDO. See BOIL, BERNARDO.

BUILDING (AS. *byldan*, to build; *bold*, Icel. *ból*, house, from Icel. *bua*, to live, abide, dwell; cf. OHG. *bān*, Goth. *bauan*, to dwell, inhabit, Ger. *bauen*, to build, Skt. *bhu*, to be). A term to designate (1) the art, trade, or occupation concerned with the constructing or putting together of the materials and parts of an object or structure of some size or importance; (2) the process of thus putting together in their proper position and relation and into final form the materials and parts of such an object, whether movable like furniture, a ship, or a machine; or immovable, as a house, church, or bridge; and (3) the product of this process (but in this sense generally limited to fixed and immovable structures). This article will treat of building in the first two senses. For the details of building processes and for illustrations, the reader is referred to the various articles treating of them. Most of these titles are mentioned specifically in the text which follows.

I. The art of building is one of the useful arts, and is as old as civilization. It is distinguished from *architecture* (which is a fine art as well as a useful art) in that it is not concerned with the element of æsthetic design which is fundamental in architecture; and from *engineering* in that it is not primarily concerned with the scientific design and mathematical calculation which are the basis of engineering. Indeed, the art of building does not necessarily include design at all, since its function is generally the execution or realization of designs which have been made by others than the builder. His work begins when the design is completed. In other words, *design* in itself is distinct from the art of building in itself, though the builder may be, and often is, the designer of a structure as well as its erector.

A. The art of building, as above defined, comprises the science or understanding of the nature and qualities of the materials used and of the processes by which they are shaped and combined. The chief materials used in building are (a) stone, the manipulations of which constitute the subart and the trade of MASONRY; (b) brick and terra cotta, which are the materials of BRICKWORK; (c) concrete, which has given rise to a subart and trade of its own; (d) wood, which is the material of CARPENTRY and CABINETWORK; (e) metal, which gives occasion for the arts of IRONWORK, BLACKSMITHING, BRONZE, etc.; and as secondary materials (f) glass, plaster, paints, etc., each associated with its own special subdivision of the art of building, as a distinct trade. In modern building various other arts or trades are often concerned, especially those of PLUMBING, GAS FITTING, STEAM FITTING, ELECTRICAL WORK AND WIRING, PAPER HANGING, ETC. The art of building includes, besides these, a knowledge of excavation, of foundations, of scaffolding, and of elementary surveying. Very few builders, if any, can expect to master thoroughly all these arts; accordingly in modern work they are assigned to various subordinates, each skilled in his own kind of work, under the general supervision of the master builder or contractor. The manner in which this is effected is discussed in section B of this article. For the more or less detailed discussion of each of these subdivisions, consult the several articles indicated by the words in capitals in the foregoing list.

The beginnings of this art are lost in the mists of the Stone age, when the cave dwellers first began to pile stones to form huts or shelters and laid across them boughs broken from the forest trees. With the invention of the flint axe and adze it first became possible to hew and frame timber and to shape the stones of walls. When bronze came into use, finer tools became possible, and how fine and even stupendous the work of the mason could be made even with bronze tools is attested by the pyramids and early temples of Egypt and the walls and tombs of Mycenæ, Tiryns, and the palaces of Crete. (See ARCHITECTURE.) In these Mediterranean lands, including Egypt, the masonry was laid "dry," i.e., without mortar, cramps or dowels being sometimes used to secure successive courses in position. In Egypt all the masonry was of cut and squared stone, often in huge blocks, fitted with extraordinary precision, as in the Royal Gallery of the Great Pyramid at Gizeh. (See PYRAMIDS.) In primitive Greece and Italy it was often polygonal or "cyclopean," the stones of irregular shape being carefully fitted together. Meanwhile in Mesopotamia, at least in Chaldæa, where no stone was to be had, necessity led to the invention of brick and mortar. Most of the bricks were sun-dried (crude brick), the scarcity of fuel rendering burned brick costly. With these poor materials, however, immense palace groups were built on huge platforms, and the arch and vault were invented for covering the drains and the long narrow halls and corridors. At the same time the art of *enameling* brick was developed into a means of decoration of great value.

The advent of the Iron age (in the Mediterranean basin about 1100 B.C.) made possible the Greek achievements in works of masonry, in which the most perfect refinement of form and exquisite finish of execution were attained, but still without the use of mortar. Wooden construction was, however, resorted to for the roofs of the larger buildings, and thus carpentry for the first time became a factor in Western building. We know, however, that it had been practiced 2000 years earlier in Egypt, though only in minor works which have perished; and that it was an important art in Phœnicia at least as far back as the time of Solomon (1000 B.C.; see 1 Kings v.-vii.), and in Persia and Lycia somewhat later.

It was under the Roman Empire that the most important and revolutionary advances were made in the art of building. Commanding the material and artistic resources of the whole civilized world during the three centuries especially from 50 B.C. to 250 A.D., the Romans combined in their public works all the hitherto-known processes of construction, and added others, developing and perfecting a system which produced works which are still the wonder of the world. The cut-stone masonry of Greece, the brickwork of Chaldæa in modified form, using only burned brick and tile, the arch derived from the Etruscans, the vault and dome introduced most probably by Asiatic artificers, were combined with marvelous inventive skill, in immense and complex structures in which for the first time the stupendous effects were produced of vast interiors at once spacious and lofty. The Romans used a remarkably strong and durable cement (*pozzolana*, q.v.) and executed massive piers and huge vaults in a species of coarse concrete of cement and small stones. They also employed

long beams of iron and trusses of bronze, though these were exceptional. They veneered their massive structures with a decorative coating of polished marble or of fine stucco (q.v.), with ornaments of mosaic and even of bronze. In Roman buildings are to be found the germs and early anticipations of nearly every achievement of the modern arts of building.

With the decline of Rome the art of building declined until it was revived at Constantinople and throughout the Byzantine Empire in the sixth century. The Byzantine builders produced new forms and combinations (e.g., the dome on pendentives; see *BYZANTINE ART* and *DOMES*), and new splendors of decoration, but hardly a new art of building. They avoided all construction in concrete and generally used stone only in conjunction with brick, often in alternate courses; but they greatly extended the art of construction with brick alone. The later Byzantine works were almost all of small size and comparatively unimportant as exemplars of the builder's art, though often admirable for their internal decorations. Meanwhile western Europe, emerging from the chaos of the so-called "Dark Ages," was developing the art of building in stone in two quite distinct fields—that of military architecture in the feudal and other mediæval fortresses and castles (see *CASTLE*) and that of ecclesiastical architecture, chiefly in monastic churches and conventual buildings. In all of these cut stone was used, usually of moderate dimensions, laid up in lime mortar, with heavy piers, round arches, and vaults of cut stone wherever the span was not too wide. Timber roofs and ceilings were used wherever vaults were impracticable. The stones were generally hewn with the mason's axe and laid up with heavy joints until the twelfth century, during which the chisel came increasingly into use, the jointing was finer, and the sculpture, carving, and elaborate construction of the Gothic styles began to appear. Monastic building declined, cathedral building increased, and the cathedral builders, first in France and later in England, Germany, Spain, and Flanders, developed new structural forms, devices, and processes. The ribbed vault, flying buttresses, and mullioned windows of stained glass enabled them to build vast churches of extraordinary loftiness and lightness, although vaulted in stone. See *GOthic ARCHITECTURE*.

With the advent of the Renaissance in Italy in the early fifteenth century the Gothic architecture and its system of construction rapidly declined. In the building of the palaces and civic monuments which multiplied under the new order the Gothic forms and system found little application. The new architecture took its inspiration largely from antique Roman art, and all materials and processes that could serve the builder's purpose were turned to account: stone, brick, wood, and plaster being used, each where most convenient. In church architecture the dome on pendentives was employed to cover the crossing of three-aisled cruciform churches as well as on plans of other forms; and these churches, designed with round arches and classic details, were built usually of cut stone, but finished internally with plaster, marble veneer, and decorative paintings. The disregard of structural expression and the desire for decorative effect at all costs led to the abuse of stucco and the resort to shams and all manner of vulgar display. To this tendency, first ap-

pearing in Italy in the late sixteenth century, are due many of the vices and less defensible practices which were common in building in the eighteenth century and which persist in the cheaper grades of building at the present time, especially in the United States. Domestic architecture in Europe received a great impulse in the seventeenth century, and led, especially in the Netherlands, North Germany, and England, to an active development of building in brick, instead of the half-timbered construction which had during the two previous centuries been the usual system for dwellings. (See *HALF-TIMBER*.) In the American Colonies, on the other hand, the abundance of forests of pine, oak, and chestnut requiring to be cut down, and the relative scarcity of building stone and of stonemasons, as well as of brick, led to the general adoption of wood for all kinds of buildings except the most important civic edifices, which were generally of brick. Brick was also employed, especially in the Southern and Middle Colonies, for the more pretentious houses; and both brick and stone were increasingly used as population and wealth increased. In the nineteenth century stone became the approved material for public buildings and for house fronts and churches in the cities, brick for schools and business buildings, wood for all suburban and rural architecture. (See *CARPENTRY*.) But even so-called "stone" buildings usually had brick walls, with a facing of stone only on the exposed exterior faces, while all the interior construction of floors, partitions, stairs, and roofs in nearly all American buildings, was of wooden beams and studs, with lath-and-plaster finish. The fires at Chicago and Boston (1871, 1872) and many other disastrous conflagrations led to the development of better building methods and of fire-resisting systems of great value (see *FIREPROOF CONSTRUCTION*), but wood still remains the favorite material for cheap houses in the country, though now hard pressed by various systems of building inexpensively with hollow tile and concrete.

Meanwhile the development of the iron industry had been introducing a new factor of the greatest importance into building, since with cast-iron columns and rolled-iron beams it was possible to construct light structures of great area with roofs of wide span, such as are required to-day for train sheds, markets, and exhibition buildings. The roof of Chartres Cathedral (1839), the Central Markets of Paris (1852), and the first Crystal Palace, London (1851), were among the earliest triumphs of the new material. This increase in the possibilities of new effects in vast unincumbered spaces (e.g., Hall of Liberal Arts at Chicago in 1893 with an area under one span measuring 1300 by 386 feet), and the system of steel-frame or skeleton construction making possible buildings of extraordinary height (e.g., Woolworth Building, New York, 57 stories, 760 feet high) constitute the two most notable advances in modern building over that of all previous ages. To this should be added, as the special contribution of the twentieth century, the development of concrete as a building material. (See *CONCRETE*.) This has made possible the gigantic achievement of the Panama Canal (q.v.), and such daringly graceful structures as the Ponte del Risorgimento at Rome, with a single arch span of 340 feet.

B. The trade or business of building is one of the most important, extensive, and highly or-

ganized of modern activities, which the multiplying requirements and increasing complexity of modern life have developed into an industry ranking with agriculture and manufacturing in the capital invested and the numbers employed. It is carried on chiefly by two methods and systems—that of *contract work*, in which an individual termed the contractor engages by a legal agreement to execute the required work for a stipulated total sum, and himself employs and pays the laborers and purchases the materials necessary thereto; and that of *day's work*, in which the person or corporation for whom the building is to be erected (termed the owner or owners) engages and pays the laborers and purchases the materials, as will be later explained in detail. Besides these methods a third has been resorted to in the past—*unpaid labor*, generally compulsory or *forced labor* in despotic communities like those of ancient Egypt, Assyria, and Rome, and wherever serfdom and involuntary servitude have prevailed. The pyramids and temples of Egypt were built by the forced labor of hundreds of thousands of serfs, and the early chapters of Exodus narrate the oppression of the Hebrews who built the store cities of Pithom and Raameses in Egypt (Ex. i. 11). This system, which prevailed in Egypt and in some parts of the Turkish Empire down to very recent years, and under which the unskilled labor of great hordes of serfs was directed by a small number of highly trained artificers and supervisors (these being usually paid for their services), was most perfectly organized by the Romans. By its means the Roman Empire was able to cover the civilized world of antiquity with superb buildings at small outlay in money. In the first place all the materials were furnished free as part of tribute or tax by different provinces or cities, and were transported free by vessels or carts in return for trade privileges; in the second place, the Roman army was turned into an immense building organization, with engineers, stone and brick masons, and carpenters attached to each legion. Not only were bridges and aqueducts built by them, but entire cities, with no pay except the cost of feeding and maintenance of the workers. Finally, all arts and trades were separately organized with a membership known to and controlled by the state, and were corporately bound to furnish free labor to the state in return for monopoly in each occupation, which no one not belonging to the association could practice. This obligation became finally so heavy a burden to the corporations as to lead to their decay.

Unpaid labor, however, was not always forced. Mediæval building shows this. It was at first, during the Monastic age (eighth to eleventh century), a modification of the Roman, with this difference, that in its artistic branches it was to a great extent a labor of love, or, at least, a willing exchange of manual labor in return for protection and a peaceful subsistence in the monasteries, which taught all the arts and trades. The masses of workmen were of two classes: either members of the monastery—full monks, lay brothers, and novices; or laymen feudally subject to the monastery, organized by trades, living in its shadow, and obliged to give their work free. When the monopoly of art passed from the monasteries in the twelfth century, the organization of free lay associations of arts and trades put an end to this condition. Only sporadically do we henceforth

find free labor and free material playing any large part in building, in such cases as when a whole community threw itself into the erection of some great cathedral under the religious enthusiasm of the Crusading age, or in grateful coöperation with the bishops as its friends and protectors against the oppressive exactions of the feudal barons.

As for the second method, building by paid day's work, we know very little about it until the Historic age in Greece, when we find it the prevailing method. The state engaged directly each workman, whether slave or free, paid him individually, and appointed officials to oversee the work. There were a business committee and technical overseers, the latter including an architect and a clerk of the works. The state supplied all materials by dealing directly with individuals, for transportation, quarrying, etc. The reports of these overseers and committees, the accounts rendered with itemized details, are extant in a number of cases, e.g., for the Erechtheum and Propylæa at Athens, the temples of Eleusis and the Parthenon. The perfection of Greek work of the Golden age in all its details is partly accounted for by the individual responsibility placed upon each workman. The Greeks never entirely gave up the direct engagement of workmen by day's work or job work on monuments of the first class, especially temples, nor did they ever leave the quantity of the materials to be used at the mercy of the contractor, even in contract work (which was sometimes resorted to), but saw that they were supplied by the state. The contract method first obtained a foothold in Greece in works of engineering, such as the erection of city walls, like those of Athens, of arsenals, like that of the Piræus, the draining of lakes, etc. Then, in the fourth century B.C., this method invaded the finer branches of building, but even then no one contractor was given the entire work; it was portioned among a multitude of small contractors, and a considerable part of the work was kept out of the contractors' hands altogether, being under the direct supervision of the state architect.

The Romans appear never to have used such individual paid labor. Livy's references show that in republican times the state, represented by the Censors, had public structures put up for a lump sum by a single contractor. With the Greeks the contractor and the architect had rarely been the same man, as was often the case among the Romans. Sometimes, however, the Roman contractor was a mere speculator without technical training, which led to many abuses, as in the famous case of Verres. Contract work thus shared with forced labor among the Romans. This was carried to an extreme by the Byzantine state, which governed the arts and trades with an iron hand. The individual responsibility of workmen and the system of day's work were not revived until, after an interval of over 1000 years, the organization of the lay artists and artisans of Italy was developed in the eleventh, twelfth, and thirteenth centuries—an organization which spread gradually to the rest of Europe, and is accountable for the return of artistic quality in the details of architecture of the late Romanesque, the Gothic, and the Renaissance periods. Membership in the guilds, which represented the culmination of this organized labor, besides conferring freedom to work, entailed obligations of good work, and, if

work was defective, expulsion followed. The labor associations of those days, unlike our own, gave more thought to the quality of their work and the development of their art than to the assertion of their claims. Architects, sculptors, and painters, even those of the highest merit, belonged to these guilds. The architects of this period usually possessed, like those of Greece, a general and even practical knowledge of the principal related arts of architectural decoration, design, sculpture, and sometimes even of painting. Even more than in the Golden age of Greece, all work was done by the employer dealing directly with individual workmen, either by day's work or job work. The head architect was engaged in the same way, and he was thus the head builder, but not the contractor. It is interesting to note how, as in Greece, contract work crept in with the decay of the Renaissance, though it did not become general until the last century.

The *modern* trade and industry of building are carried on, as has been already said, under both systems, contract work and day's labor. Under the latter the owner purchases the necessary materials and engages the workmen at so much per day or per hour, under the direction of a head builder, foreman, or superintendent paid by the day, week, or month. In important work the master builder acts as the owner's deputy in the purchasing of materials and the engaging of the workmen as well as in the conduct of the work. The *business* of building may take up his entire time, to the exclusion of any manual labor by himself. As there are men of many trades employed in any large work, those of each trade work under a foreman, who acts under the orders of, and reports to, the builder or superintendent, who is sometimes paid not by time units, but by a commission (usually 10 per cent) on all purchases of material and wages of labor, of which he renders itemized accounts to the owner. The system of day's labor makes possible the best results in the quality of the workmanship, the finish of the details, and the excellence of the materials, since there is no profit or advantage to those employed, in hurrying unduly or skimping the work and materials, but rather the contrary. But it results generally in a higher cost for a given work than that under the contract system; the work proceeds more slowly, and requires a much more careful supervision of the enterprise by the owner to prevent extravagance and waste of time, while it leaves him without redress for any defects or blunders in the work. It is therefore seldom resorted to where economy of cost is a dominant consideration, as is the case with most public buildings erected with the taxpayers' money. But it is not necessarily uneconomical, and the greatest engineering work of modern times, the Panama Canal, has in large part been built by day's labor under the direct supervision of army engineers.

The *modern contract* system is administered in several ways. Under a *general contract* a single individual undertakes, for a lump sum, to construct the entire work within a given time, according to plans and specifications furnished by the owner, who usually employs an architect to prepare these. The plans and specifications form an essential part of the contract, which is drawn up in legal form and signed by both contracting parties, the owner and the contractor. The contractor is held re-

sponsible for the quality of all the work and for its completion by the given time, and all work and materials must be acceptable and satisfactory to the architect, upon whose approval only the stipulated payments are made to the contractor. The latter purchases all the materials, and either engages directly and pays the workmen engaged or divides the work of different trades among subcontractors, each of whom engages with the general contractor to do all the work and supply all the materials required in his own trade upon the given building. Usually a part at least of the work is thus subcontracted, even where the general contractor himself employs and pays directly the remainder of the labor required. The complexity of, and the great financial interests in, much modern building have resulted in the development of a large class of contractors who have never been builders at all, i.e., they have never worked at or been trained in any of the various building crafts as manual laborers. They are rather captains of industry, skilful organizers of business, and handlers of men, who know where to buy economically, how to eliminate waste of time and material, when and how to employ machinery, and how to direct complex operations carried on by veritable armies of men. The older class of general contractors, who carry on most of the more common building enterprises, are generally men who have worked up from the ranks in some particular trade—masonry, excavation, carpentry or the like—and who themselves conduct in person the work in that trade or industry. They often develop an all-around experience in practical building of all sorts, and are then able to employ and direct personally all the various labors and laborers required.

A second method of contract building is that known as *divided contracts*, in which the owner makes separate contracts for the several operations or trades of building, with those who, by the preceding system, would have been subcontractors. The general contractor is thus eliminated, and in his place the owner employs as his personal representative a clerk of the works upon a fixed salary, to inspect and supervise the entire work and see that the various contractors fulfill their agreements without delay or interference. This is a more elastic method than the first and, at the cost of a divided responsibility, secures the direct responsibility of each part-contractor to the owner. By the first system there is often, in case of defective work, a juggling back and forth of responsibility between the general contractor and the subcontractor, each blaming the other, often with resultant litigation and its attendant costs. With divided contracts, each contractor can be held to a direct responsibility for his part of the work.

A third form of contract is sometimes entered into between owner and contractor which stipulates (a) an "upset price" or limit of total cost for the work under contract; (b) a detailed accounting by the contractor for all costs and expenses for materials and labor; and (c) a percentage commission to be paid him thereupon up to the limit of the upset price. In other words, if the cost of the work *plus* the commission amount to less than the upset price, the owner reaps the advantage of the saving; if it exceed the limit, the loss falls on the contractor. This sort of contract is less frequently adopted in America than in Europe, as its ad-

vantages over the ordinary contract are more apparent than real.

The contract system has generally prevailed in modern work because of real and solid advantages. (a) It relieves the owner of much care and of the worry and anxiety of minute personal supervision both of the work itself and of the detailed accounting therefor, which in a large undertaking is very complex. (b) It fixes a definite limit of cost which cannot be exceeded without the written consent of the owner. (c) It centres responsibility upon the general contractor, or upon the several contractors under divided contracts. (d) It secures the services of men experienced in the conduct of large building operations. (e) As the contract price is usually determined by competition, it secures more favorable terms than would be possible without competition. (f) It puts a serious obstacle in the way of capricious changes in the design; in public work this is often a signal advantage. On the other hand, it has manifest disadvantages. (a) It tends to put a premium upon cheapness rather than quality. (b) It subjects the contractor to serious financial risks, which he can cover only by skimping and cheapening to the utmost every part and phase of his work, unless he has set, and the owner has accepted, a price considerably above the real value of the work. (c) It prevents the correction and improvement of the design as the work progresses, and compels the architect in his details to conform to his contract drawings, which, owing to the owner's eagerness to "get to work," are often too hurriedly prepared, i.e., without that mature study and deliberation which an important building enterprise deserves. So complex, however, are the processes of modern building, that day's work is seldom practicable, and the contract system will doubtless prevail generally for a long time to come.

II. The processes of building can only be briefly outlined in this article. Preliminary to the actual work of the builder is the preparation of the design by the architect or engineer. The design, having been first approved by the owner in the form of "preliminary sketches" drawn to a small scale, is worked out on a larger scale (usually $\frac{1}{8}$ or $\frac{1}{4}$ of an inch to the foot) in the form of plans, elevations, and sections, accompanied by a detailed specification which describes minutely every part of the work. These (supplemented in English practice by a minutely detailed bill of quantities prepared by a quantities surveyor) are submitted to contractors for estimate—either to a selected list or to all who desire to bid upon them. Sealed bids or tenders submitted by the competing contractors are opened at a given time and place, and upon the basis of these the contract is awarded by the owner to one of them, usually but not necessarily the lowest in the price bid. A building contract is then signed by the owner and the successful bidder for the completion of the work by a given date, according to the contract drawings and specifications, supplemented by large-scale and full-size details which the architect prepares as needed for the progress of the work.

The site of the building having been surveyed, the building is "staked" out, i.e., stakes are driven and lines stretched outlining accurately the plan of the building on the site, which is then ready for the beginning of active building operations. Before these, however, can be undertaken, it is necessary, in cities which have

building laws or ordinances, to secure from the proper authorities the requisite permits. To this end the architect submits copies of his plans and specifications to the various bureaus and department officers concerned therewith, and only upon their approval can the work of building be begun. (See BUILDING LAWS.) Meanwhile the contractor has paid the required fees and secured permits for tapping the water mains, making connections with the sewers, storing explosives, temporarily obstructing the street, etc.; and has been purchasing materials, engaging workmen, and completing arrangements with the subcontractors. He is then ready to begin the first operation, that of EXCAVATION (q.v.). This is often let under a separate contract, and comprises the removal of all earth and rock to the necessary depth for cellars, footings, and foundations, the digging of the trenches for drains and gas and water pipes, and the disposal of the excavated material and of all water encountered in these processes. Difficult problems are often presented by rock, quicksand, and water, by the shoring-up of adjacent buildings, and by the necessity of blasting away the rock without disturbing adjacent properties.

The next stage of the work is that of the FOUNDATIONS (q.v.). In the case of large and heavy buildings this work is often intrusted to companies or individuals who make an exclusive specialty of it. It involves oftentimes not only the most careful engineering design, but extremely difficult and ingenious mechanical operations. The exact weight of each part of the building is computed, and the foundations so proportioned that the load upon each square foot of soil shall be well within the known bearing strength of that particular soil. Piles driven into soft soils, wide footings of concrete, concrete piles, pneumatic caissons sunk through the quicksand to a solid bottom, grillages of steel rails imbedded in cement, and inverted arches are among the many devices employed to secure this result. For small, light buildings it generally suffices to excavate trenches a little deeper than the deepest frost can penetrate, and to lay in these a footing of large stones or of concrete, upon which the foundations or the lower walls may be laid up in dry rubble, brick, or concrete, as may seem best.

Upon the foundations thus prepared the structure is erected by different processes according as it is to be of masonry of stone or of brick, of concrete, of skeleton or steel-frame construction, of half timber, or of wood. (a) *Stone Masonry*.—The principal kinds are (1) *ashlar*, which is laid with squared stones; (2) *rubble*, laid up with stones of irregular shapes, roughly fitted so as to leave no excessively large spaces between them. Coursed ashlar is that in which all the stones of any one course or horizontal row are of the same thickness; in random-coursed ashlar the beds are all horizontal, but the horizontal joints are not continuous. Dressed masonry is that in which the exposed faces of the stones are dressed to a true vertical plane. Rock-faced ashlar is that in which the faces are roughly broken, though the joints are carefully dressed. In rusticated ashlar the face of each stone is dressed so as to project considerably beyond the joints, which appear beveled or grooved. The facing stones must in all cases be laid so as to bond well into the masonry behind them (see BOND), lest frost or uneven settling split the entire "facing" away from the

"backing." The stones are laid up in lime mortar, cement, mortar of lime, sand and cement, or pure cement (really cement and sand; see MORTAR; CEMENT). In many modern buildings the facing masonry of ashlar is only from 4 inches to 8 inches or a foot thick, and the backing is frequently of brick.

(b) *Brick Masonry* is "laid up" according to various well-defined systems of bonding. The bricks laid lengthwise are called *stretchers*; those laid at right angles to the face of the wall are called *headers*. The quality of brick masonry depends upon the quality of the bricks and of the mortar, the thoroughness of the bonding, the neatness and regularity of the joints. Standard bricks measure 8 by 4 by $2\frac{1}{4}$ inches, and are laid up in ordinary work with five courses to each foot of height, or else with an allowance of 2 inches for joints to every 8 courses. Facing bricks are finer than ordinary hard bricks, and are often made of special sizes and shapes, and of a great variety of colors; they are laid up sometimes with very fine close joints, sometimes with extra thick joints, for certain artistic effects; and they are frequently tied to the backing not by bonding but by metal ties or anchors.

In laying up both stone and brick masonry the sills, jambs, lintels, and arches of all doors and windows must be provided for and set in place, and as the work progresses, the girders, joists, and beams for floors and ceilings built in, or places provided for their later installation; the flues for chimneys, ventilation, and heating, and innumerable chases or grooves and openings for the pipes, wires, etc. required in modern work must be formed as the work progresses. This necessitates extremely detailed plans and working drawings, and the orderly coöperation of architect, engineering experts, and mechanics of various trades, with the mason or contractor, and his with them. Hence the necessity that a modern contractor be a skillful organizer and commander of men; hence also the difficulty of prosecuting any large undertaking rapidly by day's labor.

(c) *Concrete Building*.—Concrete may be used for an entire building—walls, floors, and roof—or for the walls only, or for the floors only. By concrete is meant an artificial stone resulting from the hardening or "setting" of a plastic or semiliquid mixture of hydraulic cement, sand, and an "aggregate" of small stones, gravel, slag, or cinders. The concrete may be cast into blocks, to be laid up like ashlar masonry; or poured into molds which are removed when the concrete has hardened or "set." Reinforced concrete is that in which iron bars, rods, and wires are imbedded in such a manner as to take up the tensile strains, leaving the concrete to resist the compressive strains. When a "poured concrete" structure is to be erected, forms or molds of wood (sometimes of steel) are set up and strongly braced; the reinforcing bars are laid and secured in position, and the liquid concrete poured into the forms, where it is left to harden for a length of time proportioned to its mass, the longer the better. When the forms are removed, the concrete structure is ready for any surface treatment desired. For other than purely engineering and utilitarian works it is painted, or finished with a coating of stucco, or faced with brick or tiles, or with some other finish, as otherwise it presents in a short while a streaky, stained aspect which is far from pleasing. Some-

times the surface is dressed by "picking" with a mason's hammer; this gives it "texture" and disguises somewhat the streaks and stains. Owing to its excellent fire-resisting qualities, concrete is often used instead of steel beams with brick arches for floors in buildings having masonry walls; but the process is the same in principle as that just described. See CONCRETE; FIREPROOF CONSTRUCTION.

(d) *Skeleton Construction*.—This is a distinctively modern and American system of building, though approximations to it date much farther back than its practical development, first in Chicago, then in New York and other cities. By this system a framework is set up consisting of continuous vertical posts or supports of wrought iron or steel (rarely in the older work of cast iron), erected at suitable intervals of from 10 to 16 feet, with horizontal girders at each story connecting them. All the walls and permanent partitions are framed in this way, and the floor beams are laid from girder to girder. All connections are rigidly bolted or riveted, and diagonal braces are introduced to resist lateral strains and wind pressure. This skeleton sustains, therefore, all the loads and strain, and the exterior walls, being mere screens from the weather, are rarely more than 12 inches thick, and instead of supporting the frame are supported by it. The wall of each story is a really independent wall, carried upon a metal shelf borne by the girder of that story. Since every column and beam is shaped at the ironworks and brought to the building site ready for use, the frame can be set up and bolted and riveted with extreme rapidity, especially as hardly any scaffolding is required, the steel frame constituting in itself a scaffold for each succeeding story as it goes up. The men who do this work constitute a specially trained body of skilled workers organized into a distinct trade, that of the housesmiths or structural ironworkers. And as the masonry of the walls of several stories can be carried on at the same time, each starting from its own shelf, it is possible to erect and "cover in" a building of many stories in a few weeks or months, thus saving greatly in interest on the investment. The work of excavations, foundations, and interior finishing usually takes much longer than the mere erection of walls, floors, and roof. See FIREPROOF CONSTRUCTION.

(e) *Half Timber*.—This system of construction consists of a framework of heavy squared posts and girders of timber, with lighter intermediate posts and braces, having the interstices filled in with brickwork, rubble, or lath and plaster, the framework showing externally. In the later Middle Ages it was the common method of building for ordinary houses in many parts of Europe, and is still used quite frequently for country houses. It is rarely employed in the United States, though sometimes counterfeited by applying a merely decorative "timber" patterning of boards to a plastered building. See HALF TIMBER.

(f) *Building with Wood*.—In heavily wooded countries, like the United States, Norway, Sweden, and parts of Russia, Siberia, and Turkey, wood is used for many forms of building in place of masonry and steel, as for piers, docks, bridges, and, above all, houses; and the trades concerned in its shaping and assembling are those of carpentry, joinery, and cabinetmaking (qq.v.). The general principle of building with wood is

that of a frame, of which the interstices are either filled in with panels, or covered over with sheathing, clapboards, shingles, tiles, slates, or the like. In the United States various forms of framing are employed in building houses, barns, etc., the full frame and the balloon frame being the chief. In the former heavy squared posts and girders are mortised and pinned together, and stiffened by heavy braces; lighter posts, called studs, being used between the principal uprights. In the balloon frame all the uprights, as far as possible, are continuous through the whole height of the walls and are of light section (posts, 4 by 4 by 6 inches; studs, 2 by 4 or 3 by 4 inches); they are not mortised, but "toenailed," to the sills, which are laid on the foundations or cellar walls; and "girts" or planks nailed to their inner faces take the place, at each of the upper stories, of the girders of a full frame. The floor framing of girders and joists, and the roof framing of trusses, rafters, and purlins, are the same generally in either system. The frame, having been set up, is covered externally with the rough sheathing, and this in turn with shingles, slates, or tiles on the roof, and with clapboards or shingles on the sides externally. In some cases lath and plaster, and in some others a 4-inch veneer of face bricks, is substituted for the more common sheathing and clapboards or shingles. The interior faces of all outside walls, both faces of all partitions, and the under side of all ceiling joists, are then lathed for plastering (window boxings and door frames having been set in place), and the rough flooring is nailed to the joists to receive later the finished flooring.

(g) *Finishing and Accessory Operations.*—

All the various processes thus far sketched relate to the fundamental work of building; to complete a finished structure many other trades and industries must be called into service. *Plastering* is required, to apply to the wooden laths or the wire or expanded metal lathing, or to the hollow brick or tile linings of walls and partitions, successive coats of plaster of lime and sand or other special compositions, and thus produce a finished wall surface. The *plumber* sets his pipes and, after all plastering is finished, his fixtures; and the gas fitters, steam fitters, and electricians their various conduits, pipes, wires, and apparatus. The joiners and cabinetmakers make and put in place the interior finish of door trim, window trim, wainscot, moldings, etc.; the stair builders set up the finished stair work and balustrades; the glaziers put in the windows and other glasswork; the finished floors of hard wood are laid, the hardware—locks, knobs, bolts, etc.—is put in place, and painters, paper hangers, and decorators complete the work. The general contractor cleans the building down, and it is delivered complete to its owner.

In conclusion it should be remarked that modern building is notable alike for the complexity and variety of its operations, the extraordinary range and variety of its resources in materials, and the subdivision of its industries. Whereas in earlier times each country and district employed chiefly or exclusively the materials produced or found in the neighborhood, modern transportation and commerce have made available the materials and products of all lands wherever they may be wanted; so that in a building in New York, for example, the iron-work may come from Pittsburgh, wood from the

Pacific coast, marble from Italy, onyx from Mexico, and wall coverings from France. For an American college in Constantinople the steel-work and plumbing fixtures, doors, windows, and hardware were made in America, the stone for cut-stone finish came from Austria and Italy, the wood from Norway and Russia. And whereas in old times all parts were fashioned on the spot, in modern building many parts are fashioned in remote factories and workshops and brought to the building ready for immediate placing in their respective predetermined positions. Hence the modern builder is less an artisan, more a business man, than in former times; and hence arises the necessity for the complete designing of the entire building in all its details by the architect, before the construction is begun, before even the contracts can be signed. It is this that, more than anything else, has changed the character of the professions both of architecture and building in modern times, and made it so much more difficult than formerly to secure individuality and the personal touch in the execution of the details of modern buildings.

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BUILDING AND LOAN ASSOCIATIONS. Private corporations designed to furnish a safe means for the accumulation of savings, accompanied with an opportunity to secure money at reasonable rates for the purpose of building homes. The term is here used to cover a variety of organizations with similar purposes and methods of business, as mutual loan associations, homestead aid associations, savings fund and loan associations, coöperative banks, coöperative savings and loan associations, building societies, etc. In Great Britain the organizations exist under the latter title, while in Germany they are known as *Baugenossenschaften*. The first in England was organized in Birmingham in 1781. They became numerous during the nineteenth century, and acts were passed in 1838 and in 1874 regulating them.

The first association of this character in the United States was organized in Frankford, a suburb of Philadelphia, in 1831, under the title of The Oxford Provident Building Association. Many were organized in the decade from 1840 to 1850, which may be considered as the real period of their inception in this country. The number of building and loan associations in the

year 1911-12 was 6099, with a total membership of 2,332,829 and total assets of \$1,030,687,031. Pennsylvania, Ohio, New Jersey, Illinois, Massachusetts, New York, and Indiana are the States in which building and loan associations have had their highest development. Three-fifths of the membership and two-thirds of the assets of the building and loan associations of the United States are to be credited to those six States.

When a man becomes a shareholder in a building and loan association, he pays a certain sum each month until the aggregate amount paid, increased by profits, equals the maturing value of the share, which is usually \$200. The capital of the association is thus made up of the savings, and interest upon the savings, of its members and is increased from month to month, and from year to year. Provision is made in all associations for the withdrawal of members before the shares mature. On this account a share, before it matures, may be said to have two values—the holding and the withdrawal values. The former is the actual value at a particular time. The latter is frequently much less than the actual value. All associations stipulate the conditions under which members may withdraw before their shares mature, and, while these conditions differ, they are of such a nature as to discourage severing connection with the association.

A stockholder may borrow not to exceed the par value of his stock, if he can give satisfactory security. If there is a limited amount of money to be loaned, and several prospective borrowers, the money is loaned to the one who offers, in addition to regular interest, the highest bonus or premium. The borrower is required to pay monthly interest upon his loan in addition to dues on his stock. The stock at maturity becomes the property of the association and extinguishes the principal of the loan.

The building and loan associations in the United States are divided into the national and local associations. These differ mainly in the scope of their operations, as the methods of organization and management of them are practically identical. The local association limits its operations to a community, often a county, while the national association makes loans anywhere and sells shares to individuals regardless of residence except so far as State laws prohibit foreign associations from operating in the State, as is not infrequently the case. National associations have not, as a rule, been highly successful, and in the last two decades have greatly declined in number and in volume of assets. They are at present practically a negligible factor. Building and loan associations are under the control of a president and board of directors; however, the secretary and the treasurer are usually the most important factors in their management. A property committee usually passes judgment on securities before money is loaned. Failures of the associations are due to inefficient management and especially to granting loans without adequate security. A majority of the States require periodic examinations of the business of these associations by State officials; most of the remaining States rely upon incorporation provisions relating to investment and management to insure solvency.

The building and loan association has served to stimulate thrift and to increase the number of persons of moderate means who own homes. Subscription for building and loan association

shares results virtually in compulsory thrift, since withdrawals are attended by a very material loss. The high rate of interest paid on all sums invested is a further inducement to thrift. Such rates of return imply heavy charges upon borrowers, who pay a rate on loans usually much in advance of the current rates on loan capital. It is, however, to be borne in mind that those who borrow funds from the associations would, as a rule, be unable to obtain loans from any other source, and hence would be unable to acquire homes without the aid of the associations. It is none the less true that in many cases the complicated form of payment blinds the borrower to the actual rate of interest he is compelled to pay. Consult: Dexter, *A Treatise on Coöperative Savings and Loan Associations* (New York, 1889); Thompson, *A Treatise on Building Associations* (2d ed., Chicago, 1899); *Ninth Annual Report of Commissioner of Labor* (Washington, 1893); *Bulletin No. 52, Bureau of Labor* (Washington, 1904); Rosenthal, *Building, Loan, and Saving Associations* (Cincinnati, 1911). The League of Local Building and Loan Associations reports at its annual meetings statistics of the associations.

BUILDING LAWS. Statutes restricting to a greater or less extent the common-law right of landowners in cities to erect buildings on their land. They often prescribe the materials of which buildings shall be constructed; the manner in which they shall be lighted, ventilated, or drained; the amount of open space about them, as well as their height and their distance from the street line. In general, the interference of such statutes with the property rights of the citizen is justified by considerations of public policy. Specifically their object is to secure proper sanitary conditions and to diminish the frequency and disastrous consequences of fires in cities. New ideals of beauty in the building up of cities are also finding expression in the enactment of statutes and municipal ordinances limiting the height of buildings in favored portions of some of our great cities. In the United States the constitutionality of such legislative interference with property rights has been sustained as coming within the police powers of Congress and of the several States. The most important statutes of this kind in England are the London Building Act of 1894 and the Public Health Act of 1875. In the United States such matters are usually regulated by city ordinances, although the construction and sanitation of tenement houses in New York and other large cities has become the subject of State legislation. Consult: Emden, *Law Relating to Building* (London, 1895); Ash, *Building Code of New York City* (New York, 1899); and see TENEMENT HOUSE PROBLEM, and the authorities cited.

BUILDING LOANS. Loans made to persons who are owners or lessees of land, to be used by them in defraying the cost of buildings to be erected by them on such land. Such loans are usually made under a contract, which recites the nature of the borrower's interest in the land, sets out in detail the character and estimated cost of the structure to be erected, and contains a promise by the borrower to use the money so obtained exclusively for the building operations mentioned in the contract and according to its terms. The loan is generally secured by a mortgage on the property in question to cover the future advances on the loan, which are made in stated installments as the

building progresses. Such loans are usually somewhat precarious investments, because of the danger that the builder may not be able to complete the structure, in which case the incomplete building usually cannot be sold for what it cost, and the lender is forced to foreclose the mortgage, buy in the property, and complete the building in order to protect himself. Building loans, therefore, bear a higher rate of interest than is usual in loans on real-estate security. Many States have provisions for the filing of such contracts in some office of public record, as well as for recording the mortgages, regulating their priority with reference to other liens, as judgments and mechanics' liens (q.v.). Such loans are usually paid off when the building is completed, because of the high rate of interest, the money being obtained on a "permanent loan," (i.e., a loan for a definite number of years), at a lower rate of interest. Building loans of this description have become very common in recent years, especially in large cities. The term is also applied to loans by building and loan associations (q.v.).

BUILDING OF THE SHIP, THE. A poem by H. W. Longfellow (1849).

BUILDINGS, FIREPROOF. See **FIREPROOF CONSTRUCTION.**

BUILDING SOCIETIES. See **BUILDING AND LOAN ASSOCIATIONS.**

BUILDING STONE. A stone suitable for structural engineering and architectural purposes. Most of the stone quarried is for ordinary dimensional work. For ornamental use the stone must lend itself to carving, and for monumental work it should also take a good polish. Inscriptional decoration calls for a stone that will not only cut to sharp lines, but also give good contrast between the cut and polished surface, a character found in many of the darker granites and marbles. The factors influencing the selection of a stone are beauty, cost, and durability. (For statistics of building stone in the United States, see article **UNITED STATES, Stone.**)

Consult: Howe, *The Geology of Building Stones* (London, 1910); Watson, *British and Foreign Building Stones* (Cambridge, Eng., 1911); Canada Department of Mines, *Report on Building and Ornamental Stones of Canada*, vol. i (1912).

Durability. The ability of a stone to resist the attacks of the weathering agents is a factor of great importance, which is too often but little recognized. It depends primarily on its frost resistance, degree of insolubility, and power to withstand changes of temperature. Stones which absorb considerable water may disintegrate under frost action, provided the water fills the pores sufficiently to exert internal pressure when it expands on freezing. Constant expansion and contraction under changes of temperature will eventually bring about surface disintegration of some stones, especially if coarse-grained. Calcareous rocks show some susceptibility to the solvent action of acid rain waters. Injurious minerals may by their decay hasten the disintegration of the rock. Thus pyrite changes to limonite and liberates sulphuric acid, which attacks any carbonates in the rock. Mica, if present in quantity, in sandstones causes them to split under frost action, while if in marbles it weathers out, leaving a pitted surface.

The period of time that a stone resists the weather without showing signs of disintegration

is known as its *life*. The following approximate figures may be given, and refer to the life of the stone when exposed to a moderately severe climate:

Kind of Stone	Life in Years
Many serpentines	1 to 5
Micaceous marbles	2 to 15
Laminated micaceous brownstone	15 to 30
Compact brownstone	50 to 200
Coarse fossiliferous limestone	20 to 40
Fine oolitic limestone	30 to 40
Marble, coarse dolomitic	40 to 50
Marble, fine dolomitic	60 to 80
Marble, fine	50 to 100
Granite, even textured	75 to 200

Physical Properties. The texture of stones varies from coarse to fine and from even granular to porphyritic. A fine-textured, even-grained stone is the more durable, with other things equal. The hardness of a stone depends in part on the hardness of its component minerals, and in part on their state of aggregation. A rock composed of quartz grains might be so poorly cemented as to be too soft for structural work. Color in building stones is variable, and may be white, brown, red, yellow, gray, buff, black, etc. In igneous and metamorphic rocks the color is due to that of the prevailing minerals, while in sedimentary rocks it is due usually to iron oxide or carbonaceous matter. Some stones change color slightly on exposure, as the Berea, Ohio, sandstone, which turns buff, or some green slates which fade. Polish depends on the density of the rock and character of its mineral constituents. A mass of the same minerals takes a better polish than a mixture of minerals. Quartz, feldspar, and calcite take a good polish, while hornblende and augite are less favorable, and mica is difficult to treat.

Absorption, or the amount of water which a stone will absorb varies even in the same class of rocks. Dense rocks like granites, gneisses, slates, marbles, many limestones, and quartzites, usually show under 1 per cent absorption. Others, including many sandstones, the softer limestones, and volcanic rocks may absorb from 2 up to 15 per cent. Quarry water is that found in the pores of many rocks when first quarried. It is negligible in rocks like granite, but may be sufficiently abundant in limestones and sandstones to prevent their being quarried in freezing weather. Crushing strength is a property to which undue importance is attached. A stone which is too weak to be used in structural work bears such evident marks of its unfitness as to deceive no one. The higher crushing strength of metamorphic rocks and the denser igneous rocks is due to their particles being interlocked by crystallization, while the sedimentary rocks, which average lower in crushing strength, owe it to the cement bond between the grains. A stone may show a different strength when tested on bed than on edge, and often a lower strength when wet or after freezing.

Frost resistance is dependent on size, shape, and abundance of pores, and cohesion. The fire resistance of most stones is low, and many disintegrate badly when exposed to the combined attack of fire and water. Abrasive resistance depends in part on the state of aggregation of the mineral particles and in part on their individual hardness. Stones of low abrasive resistance should not be used for pavements or floors. Such include many serpentines, marbles, and the softer sandstones.

Stones Used for Building. Nearly every kind of stone is used for structural work. Sandstones are employed chiefly for ordinary dimensional blocks, and certain ones for ornamentation. Most limestones are put to the same use. Marble finds its main application for interior and exterior decoration, monumental work, and to a lesser extent for dimensional stone. Certain granites are employed for monumental purposes, but the majority are of value for massive construction. Slate is selected primarily for roofing purposes, and also for wainscoting, stair treads, etc.

Granite. Of the crystalline siliceous rocks, granite (q.v.) is undoubtedly the best known and most deservedly popular as a building stone. Commercially this term "granite" is applied to all igneous and metamorphic rocks (see IGNEOUS ROCKS; METAMORPHIC ROCKS), but still the use of true granites predominates. They, together with syenites, include the strongest of building stones, ranging in crushing strength from 25,000 to 43,000 pounds per square inch. They are very resistant to frost action and are commonly permanent in color. Until comparatively recent times, on account of its great hardness, granite was employed almost wholly for massive masonry, since it could be used there with a comparatively rough dressing; but with modern improved stone-cutting and dressing machinery, it is now turned and carved into columns, pilasters, etc., and polished with the utmost perfectness. In all times, however, granite has been one of the most popular of building stones. The red granite of Syene, Egypt, was fashioned by the ancient Egyptians into obelisks, sarcophagi, and colossal statues, and employed by them in building their temples, pyramids, and palaces. Modern granites range in color from nearly white to dark gray and from a delicate pink to a deep red. The average weight of granite is about 166½ pounds per cubic foot, and its crushing strength averages from 15,000 pounds to 25,000 pounds per square inch. Suitable granite for building purposes is found widely distributed. The Scotch granites are the coarse red from Peterhead and the gray from Aberdeen. It is of the latter stone that the city of Aberdeen is largely built. Scotch granite is quite largely imported to the United States for monumental work. Both gray and red granite are quarried in Canada, stone of one or both colors occurring in British Columbia, near Vancouver; in Quebec, in many localities around the lakes at the heads of the St. Francis and Megantic rivers; in Ontario, near Kingston; in New Brunswick, near St. George. The principal English granite is perhaps that from Westmoreland County.

In the United States granite occurs in a number of States. The areas are: 1. Atlantic coast crystalline belt from Maine to Alabama. 2. Minnesota-Wisconsin area. 3. Southwestern area, including Missouri, Arkansas, Oklahoma, and Texas. 4. Rocky Mountain area, which includes many other igneous rocks. 5. Black Hills area. 6. Pacific coast belt. The greatest supply of granite in this country comes from Maine and Massachusetts. The Maine granites are mostly found in shades of gray, but there are a number of pink and red granites quarried. In Massachusetts the dark blue-gray granites quarried in the vicinity of Quincy are the best known. Other noted granites come from Concord, N. H., Barre, Vt., Westerly, R. I., Richmond, Va., Stone Mountain, Ga., Iron County, Mo., St. Cloud, Minn.,

and Wausau and Montello, Wis. Besides granite, the crystalline siliceous rocks include porphyry, syenite, gneiss, and trap. Porphyry makes a very handsome building stone, showing large crystals imbedded in fine-grained groundmass, the crystals usually being of a contrasting color to the groundmass, and these colors ranging through the shades of pink, gray, red, white, and black. That found in the United States is but little used. Syenites differ from granite in containing no quartz. They are found in considerable quantities in the United States and make a very handsome stone, but so far they have not been quarried to any extent. Gneiss is a rock resembling granite or even other igneous rocks in composition, but is unlike granite in having a banded structure and being more abundantly jointed. Trap includes a number of crystalline siliceous rocks, generally sombre in hue and very difficult to work. Except as crushed for making concrete or road material, or when cut into paving blocks, trap is seldom used for construction purposes. It formed the Palisades of the Hudson River.

Limestone. Limestone consists of carbonate of lime and some impurity which gives the stone its color, these colors ranging through various shades of blue, green, yellow, pink, red, and black. Dolomitic limestone, or dolomite, is a species which contains magnesia in addition to carbonate of lime. The distinction between limestone and marble is one of texture rather than one of composition, marble being a crystalline limestone capable of taking a high polish, and having a coloring or marking which adapts it to ornamental work. In the trade, however, any lime rock that will take a polish is called marble. The coarser grades of limestone are widely distributed, and nearly every State of the United States has quarries which are worked to supply at least the local demand. Perhaps the most widely known of the limestones of this country are those of Indiana and northern Kentucky. These are oölitic limestones; they are very fine and even in texture, strong and easily worked, and of handsome color. This limestone is popularly known as "Bedford stone." At Lamont and Joliet, Ill., there are also notable quarries of fine-grained, light-drab limestone, which is extensively employed. In the great valley west of the Appalachians the Shenandoah limestones are worked from Pennsylvania to Virginia and southward. Among the foreign limestones the Portland stone, from the Isle of Portland, England, has been favorably known for a great many years. It was used in the reconstruction of St. Paul's Cathedral. The Caen stone (q.v.) of France is one of the most noted limestones of the world. It is a soft, fine-grained stone, very light colored, admirably adapted for carved work, but so absorbent as to be entirely unfitted for out-of-door work in a cold climate. The stone is quarried near Caen, Normandy.

Marble. The principal sources of American marble are in the States bordering the Appalachian Mountains, and particularly Vermont, Massachusetts, western Connecticut, eastern New York, Georgia, and eastern Tennessee. Nearly 60 per cent of the marble quarried in the United States comes from Vermont. Vermont marbles range through all varieties of texture and various shades of color, from pure, snowy white to quite dark-bluish and greenish stone, the white stone often being beautifully mottled and veined with the darker stone. The principal centres

of the Vermont marble industry are West Rutland, Dorset, Wallingford, Pittsford, Brandon, and Middlebury. Next to the Vermont marbles, those of Tennessee merit the most particular notice, because of their beautiful variegated colors, among which are found chocolate, red, pink, olive, green, brownish red with white spots, gray with lemon spots, and other combinations of colors. Georgia contains very large marble deposits, some of which furnish very beautiful stone, and this is now widely used for structural and monumental work. Besides the Appalachian marbles, there are deposits of this stone in several of the Rocky Mountain States, but these have not been much worked. California also supplies some.

Among the most notable foreign marbles are the brilliant red marble found at several localities in the French Pyrenees, and the Languedoc marble, having a brilliant scarlet color blotched with white, found at Black Mountain, in the Pyrenees. Brocatelle marble, having a light yellow body traversed by irregular veins and blotches of dull red, is another famous French marble. Belgium is exceptionally rich in colored marbles, but white is not found. The deep blue-black marble with white veins, known as St. Anne marble, and the pure black marble, known as Belgian black, are particularly well-known Belgian marbles. Most of the other Belgian marbles are dull red, of light and dark shades, variously spotted, flecked, and veined with white and gray. The Italian marbles are proverbial for their quality and variety. The two most noted are the white statuary marble with its fine grain and pure color, which, when polished, gives a waxy appearance found in no other marble; and the Siena marble with a bright yellow ground blotched with slight purplish and violet shades. The black and gold marble, with a black ground carrying yellowish and reddish veins, is another noted Italian marble. Germany, Spain, Portugal, Austria, and Ireland furnish marbles notable for texture and color. Marbles of much beauty have been quarried in recent years in Ontario and Quebec. A form of marble—variously known as onyx, or onyx marble, but really a travertine formed by the evaporation of water holding carbonate of lime in solution—is found extensively in Algeria and Mexico and is much used for table tops and other small decorative and ornamental work. A good quality of onyx marble is found in Arizona and southern California, in the United States. Serpentine, a marble composed of the mineral serpentine and other impurities, is a stone of high beauty and great value for interior decoration. The best stones come from Greece.

Sandstones. Sandstones (q.v.) are composed of rounded and angular grains of sand, so cemented and compacted as to form a solid rock. The cementing materials are silica, oxide of iron, and carbonate of lime. Silica cement gives a white colored stone, very firm and durable, but difficult to work; oxide of iron cement gives a brownish or reddish stone of fair durability and fairly easy to work; and carbonate of lime gives a grayish stone soft and easy to work, but less durable than when either oxide of iron or silica forms the cementing material. Some sandstones have a clayey cement, which makes them easier to work, but if too abundant attracts moisture. Often the cemented grains comprise feldspar and mica. The texture of sandstones varies from exceedingly fine-grained stones to those com-

posed of pebbles of various sizes, the latter being called conglomerates. Sandstones vary in color; light gray, buff, drab, blue, brown, pink, and red being the colors of well-known varieties. Sandstones generally are softer when quarried than after a period of seasoning.

Good sandstone for structural purposes is found so widely distributed in the United States that it is impossible to mention all of even the notable deposits. The Berea stone, of Ohio; the Medina stone and bluestone, of New York; the Portland stone, of Connecticut and Massachusetts; and the red and brown sandstones, of New Jersey, are among the most extensively quarried and best known. Of the foreign sandstones the variety is quite as great as in the United States.

Slate. Slate is a metamorphosed shale or sometimes metamorphosed igneous rock which easily splits into sheets of considerable thinness. It is used chiefly for roofing purposes, mantels, floor tiles, and flagging, billiard tables, sinks, and blackboards. Most of the slate quarried in the United States comes from a belt extending from Maine to Georgia. Some is also quarried in Arkansas and California. Since 1897 the United States producers have begun to build up an export trade. In Europe the Welsh slate quarries and those of Ardennes, France, are the greatest producers.

Quarrying and Dressing. The methods of quarrying building stone vary according to the nature of the stone. In all methods the object aimed at is to obtain large and well-shaped blocks free from incipient fractures. For this reason the use of explosives is resorted to as little as possible. (See QUARRY; QUARRYING.) Dressing stone is very largely handwork, although many kinds of machinery are also employed for polishing, planing, and sawing soft stones and for splitting slate. See STONE CUTTING AND DRESSING.

Bibliography. For the strength of various kinds of building stones, see STRENGTH OF MATERIALS. See also BATH STONE; BROWNSTONE; CAEN STONE; FREESTONE; GRANITE; LIMESTONE; MARBLE; SANDSTONE; SLATE; STONE, ARTIFICIAL; BUILDING; MASONRY. For comprehensive popular treatises on building stones, consult: Ries, *Building Stones and Clay Products* (New York, 1912; contains bibliography of many others); Merrill, *Stones for Building and Decoration* (New York, 1903); Renwick, *Marble and Marble-Working* (London, 1909); Hermann, *Steinbruchindustrie und Steinbruchgeologie* (Berlin, 1899); Hirschwald, *Handbuch der bautechnischer Gesteinsprüfung* (Berlin, 1912).

BUISSON, bwé'sôn', FERDINAND EDOUARD (1841-). A French administrator, publicist, and pedagogue. He was born in Paris. In 1871 he was appointed inspector of elementary schools by Jules Simon, then Minister of Public Instruction. His nomination was bitterly attacked, more particularly by Dupanloup, Bishop of Orleans, who denounced in the National Assembly several pamphlets published by Buisson in which he recommended the exclusion from the schools of all moral instruction not purely secular, and the omission of sacred history from the curriculum of the younger pupils. Compelled to resign, Buisson was afterward appointed commissioner to the expositions held in Vienna (1873) and Philadelphia (1876). In 1878 he became chief inspector of elementary education, and in the following year Jules Ferry appointed

him director of that department. The introduction of the new education in the elementary schools under his jurisdiction has been remarkably rapid. In 1896 he resigned and was appointed to the chair of pedagogy in the Faculté des Lettres at Paris. He was elected to the Chamber of Deputies as a Socialist in 1902, but retired from public life in 1906. He is the author of: *Dictionnaire de pédagogie* (1892-84); *Proposition de loi tendant à établir un examen annuel de l'instruction des conscrits* (1908); *Nouveau dictionnaire de pédagogie* (1911); *La foi laïque* (1912).

BUITENZORG, boi'ten-zörk (Dutch *buiten*, without + *zorg*, Ger. *Sorge*, Eng. *sorrow*; equivalent of the French *sans-souci*). A town in the Presidency of Batavia, Java, about 40 miles south of the capital (Map: Australasia, C 3). It is a place of exceptional natural beauty, and its elevated location (about 750 feet) makes it one of the healthiest settlements in Java. It is the real seat of the governor-general, whose magnificent palace is situated amid the botanical gardens, which are considered fine examples of horticultural art. It is also the fashionable summer resort of the island and is connected by rail with Batavia. There is some trade in coffee, sugar cane, rice, and spices. Pop. (1895), 24,610.

BUJALANCE, bōō'há-lán'thá. A city of Andalusia, Spain, about 20 miles east of Córdoba (Map: Spain, C 4). It is surrounded by a moat and a wall flanked with old towers and contains an old Moorish castle (935) and a college. The city has manufactures of leather, woolens, glass, and pottery, and exports of agricultural produce. An important cattle fair is held here. Pop. 1900, 11,245; 1910, 11,281. Various remains found in the vicinity bear witness to the antiquity of the city, but its identity as the ancient Vogia, mentioned by Ptolemy, while asserted by some authorities, is doubted by others. Bujalance attained to prosperity under the Moors and in 1227 was conquered by Ferdinand III.

BUKA, bōō'ká. The northwesternmost of the Solomon Islands, separated by Bougainville Strait from Bougainville Island. Mangrove swamps line the coast, while the interior is mountainous. Trade is in tortoise shell and sandalwood. Area, 290 square miles. Pop., 15,000.

BUKHARA. See **BOKHARA**.

BUKHAREST. See **BUCHAREST**.

BUKHARI, bu-kā'rē, or **BOKHARI**, bō-kā'rē, ABU ABDALLAH MUHAMMAD IBN ISMAIL AL (810-870). An Arabic scholar, the great imam in the science of the *hadith*, or traditions. He was born at Bokhara (whence his name), and he early devoted himself to the study of Mohammedan traditions. At the age of 17 he made the pilgrimage to Mecca and to Medina, and he subsequently visited nearly every part of the Mohammedan world, associating with the most distinguished representatives of the *hadith*, and collecting in Khorasan, in the cities of Irak, in the Hedjaz, in Syria, and in Egypt a great number of traditions, 7275 of which he arranged and classified in his celebrated work, *al-Jami al-Sahib* (The Authentic Collection), regarded by Mohammedans as the most sacred book after the Koran. It is said that 90,000 persons had learned the *Sahib* from Bukhari. He died in banishment at Kartauk. There is an edition of Bukhari's work published in 3 vols. by Krehl (Leyden, 1867-68).

BUKIDNON, bōō-kid'nōn. A Malay word signifying 'mountain people.' It is generally used to designate the powerful pagan tribe inhabiting the subprovince of Bukidnon and the headwaters of the Pulangi River in Mindanao. Their language is closely related to the Visayan. See **PHILIPPINES**.

BUK'KUM WOOD. See **SAPAN WOOD**.

BUK'KUR. A fortified island of the Indus, in Sindh, British India, in lat. 27° 39' N. and long. 68° 56' E. It is 400 yards from Rori, on the left bank, and 100 from Sukkur, on the right. Bukkur is no longer of any military value, as it is commanded, on both sides, by higher grounds, but is important as the central point of the great railway cantilever bridge 1200 feet long spanning the Indus here since 1889.

BUKOWINA, bōō'kō-vē'ná ('the country of beech trees,' from Slav. *bukŭ*, Ger. *Buche*, Eng. *beech*). A crownland of Austria, with rank of duchy, bounded by Galicia on the north and northwest, Hungary on the west, Rumania on the south, and Rumania and Russia on the east. Its area is 4031 square miles (Map: Hungary, J 3). Bukowina belongs mainly to the region of the Carpathian Mountains, by which it is traversed in several parallel chains, the highest point being 6100 feet. The principal rivers are the Pruth, Sereth, and Dniester. The climate, although somewhat raw, is generally healthful. The soil is very productive, especially along the Pruth and Sereth. In 1910, of the total area of 1,044,191 hectares, 312,216 were arable land, 8505 garden, 257,644 meadow and pasture, and 448,144 woodland. The common European cereals and industrial plants are raised in abundance, and the extensive areas of pasture land render the country well adapted for cattle raising. The mineral production is of little importance, and the manufacturing industries are largely confined to brewing, distilling, and milling. Commerce, chiefly confined to raw products, is little developed, although the crownland is well provided with roads and railways. The Diet of Bukowina is composed of 63 members. The crownland sends 14 deputies to the Austrian Reichsrat. Education, though not well advanced, is improving. In 1908-09 the 502 public and 25 private elementary schools had 113,142 pupils. In 1911-12 the 12 gymnasias, realgymnasias, and realschulen had 6817 students, and the University of Czernowitz 1229. According to the census of 1900 Bukowina had a population of 730,195, showing an increase of 12.9 per cent for the decade; Dec. 31, 1910, 800,098, showing an increase of 9.6 per cent. In 1910 about 305,000 were Ruthenian, 273,000 Rumanian, 169,000 German, and 36,000 Polish. Adherents of the Greek Orthodox church numbered about 548,000, Jews 103,000, Roman Catholics 99,000, Greek Catholics 26,000, and Evangelicals 20,000. The capital is Czernowitz, with a population of 67,622 in 1900 and 87,128 in 1910.

Bukowina was included in the ancient Roman Province of Dacia, and during the Middle Ages was settled by peoples of different stocks. About the beginning of the fourteenth century it came into the possession of Moldavia, and its principal town, Suczawa, was the seat of the Moldavian Hospodar. Its strategic position gave it importance for a time in the wars of southern Europe. In 1769 it was occupied by Russia. It was acquired by Austria in 1777 and made a crownland in 1849. Consult Kaindl, *Geschichte der Bukowina* (3 vols., Czernowitz,

1896-1903); *Bukowina* (Vienna, 1899); *Geschichte der Deutschen in den Karpathenländern*, vol. iii (Gotha, 1911); Mittelmann, *Führer durch die Bukowina* (Czernowitz, 1907).

BULACÁN, bōō'lā-kān'. A province and a town of Luzon, Philippines (Map: Luzon, Philippine Islands, F 7). The former covers an area of 1173 square miles and had a population (1903) of 223,742. The surface is mountainous and the soil is fertile and well cultivated, producing sugar, cacao, rice, indigo, vegetables, and fruits. It contains some deposits of iron and magnetite, and the rivers yield small quantities of gold. The principal manufactures are cotton and silk fabrics. The capital is Malolos (q.v.). The town Bulacán, the former capital, is situated about 22 miles from Manila by rail. It is well built, with wide streets, and has a monument to the botanist Blanco. Pop., 1903, 11,589.

BULAK, bōō'lāk'. A suburb and port of Cairo, Egypt, situated on the right bank of the Nile, 2 or 3 miles north of Cairo (Map: Egypt, E 2). It is connected with Cairo by an electric tramway and contains a fine mosque, foundries, a paper mill, an arsenal, and one of the largest printing houses in Egypt. The Egyptological museum formerly located at Bulak has been transferred to Cairo. Pop., 1897, 76,281.

BULAMA, bōō'lā-má. The easternmost of the Bissagos Islands west of Senegambia, in lat. 11° 34' N., long. 15° 33' W. (Map: Africa, C 3). It is the chief city and seat of government of Portuguese Guinea. See BISSAGOS.

BULAN, bōō'lān. A town of Luzon, Philippine Islands, in the Province of Sorsogón, situated about 28 miles from Sorsogón, the capital. There is considerable coast trade. Pop., 1903, 13,431.

BULAU, bōō'lou (Malay), or **TIKUS**. English local name, moon rat. A ratlike insectivore (*Gymnura rafflesii*) of the Malayan Islands, closely akin to the hedgehogs, but without spines or ability to roll into a ball. In superficial appearance it is opossum-like, with long, creamy-white fur, mixed with still longer, bristly black hairs. It has a very long, naked, flesh-colored tail, and an elongated, tubular snout, with terminal nostrils which are furnished with elaborate external lobes or flaps. The moon rat is nocturnal and feeds on insects. It gives forth a peculiar, strong, musky odor. It is savage and morose, snarling at the approach of any one, and will live but a short time in captivity. A single young one is born at a time. In spite of its musky smell, the natives consider it excellent eating. The body is 12 to 14 inches and the tail 9 or 10 inches long.

BÜLAU, by'lou, FRIEDRICH (1805-59). A German writer on political economy. He was born at Freiberg and studied at the University of Leipzig (1823-26), where he was appointed in 1833 to the chair of applied philosophy and political science. The principal works of this prolific writer include: *Encyklopädie der Staatswissenschaften* (1832; 2d ed., 1855); *Geschichte des europäischen Staatensystems* (3 vols., 1837-39); *Wahlrecht und Wahlverfahren* (1849); *Geheime Geschichten und rätselhafte Menschen* (12 vols., 1850-60; 2d ed., 1863-64).

BULAWAYO. See **BULUWAYO**.

BULB (Fr. *bulbe*, Lat. *bulbus*, from Gk. *βολβος*, *bolbos*, bulbous root). A leaf bud, mostly subterranean, in which the leaf bases are thick-

ened, being full of stored food. The thickened leaf bases are very much crowded together and form the conspicuous part of the bulb. "Scaly" bulbs are those in which the leaf bases are comparatively narrow and small, and are imbricated,



BULB OF TULIP.

as in the common lily. "Tunicated" or "coated" bulbs are those in which the leaf bases are very large and completely enwrap one another, forming concentric coats, as in the onion and tulip. When fresh, the scales of the tunicated bulb are rather thick, but when dry they become thin and even papery. "Bulblets" are small aerial bulbs which either replace flower buds, as in the onion, or which arise from the axils of leaves, as in the tiger lily.

The significance of bulbs in the life history of the plants which produce them is that they enable the plants to develop new working structures with great rapidity. For example, a new plant completely equipped for work may be derived from a bulb in very much shorter time than from the seed. Such a habit enables plants to take advantage of short seasons of opportunity. See **GEOPHYTE**.

BULBUL, bul'bul. Originally an Arabic-Persian name for the Persian nightingale (*Daulias hafizi*, or *Aedon goleii*), which found its way into English poetry chiefly through the patronage of Lord Byron. But the same name is given in southern and southeastern Asia to various birds of the family Pycnonotidæ, especially to those of the genus *Pycnonotus*. These are small birds, often of very brilliant plumage, closely allied to the thrushes, occurring in India, Persia, and Palestine, and southward to South Africa. The common bulbul of India (*Molpastes fuscus*, or, as it was called formerly, *Pycnonotus hamorrhous*) is a familiar visitor in small companies to all gardens, tea plantations, etc., from Ceylon to Bengal. It "not infrequently builds its nest in verandas and is consequently a universal favorite with Europeans." Its singing is a "chirruping warble," and it feeds upon fruits. The crested males are highly pugnacious—a trait utilized for amusement. Says Murray, *Avifauna of the Island of Ceylon* (London, 1890): "It is commonly caged throughout India, or kept tied by a cord around the waist. Being

pugnacious, they are made to fight for small prizes, and when being trained for this purpose are fed on minced meat and a compound made of wheat flour, sugar, and milk, boiled together." A South African species (*Pycnonotus tricolor*) has the amusing habit of becoming intoxicated upon syringa berries and fermenting fruits, when it reels along the ground and is easily captured (Layard, *Birds of South Africa*, London, 1875-84). See Colored Plate accompanying THRUSH, and Plate of LYRE BIRD, ETC.

BULFINCH, CHARLES (1763-1844). An American architect, the first to prepare himself for his profession by a careful education both at home and abroad. He was born in Boston, graduated at Harvard in 1781, and spent the years 1785-87 in travel and the study of architecture abroad. His first work after his return was the Doric memorial column erected on Beacon Hill, Boston, to replace the former beacon. A more important work was the designing in 1793 of the old Federal Street Theatre, Boston, the first playhouse erected in New England. In 1795 he drew the plans for the "new" State House in Boston, which was completed in 1798. In 1805 he remodeled Faneuil Hall, in 1810 designed the Suffolk County Courthouse in Boston, and in 1814 designed University Hall in Cambridge. Between these dates he designed the Connecticut State House, now the City Hall, at Hartford, Conn. From 1798 to 1818 he was elected annually chairman of the Board of Selectmen of the town of Boston, an office corresponding closely to the later office of mayor, and during this period endeavored to secure the straightening and widening of the streets, to provide a system of street lighting, and otherwise to modernize the old town; but he lost almost his entire fortune in a real-estate venture, the building of Franklin Place. He designed the Massachusetts General Hospital, the corner stone of which was laid in 1818, and the McLean Asylum in Somerville, and in the same year succeeded Benjamin H. Latrobe as architect of the National Capitol in Washington. The rotunda was built from drawings of his own, after plans suggested by Latrobe, and he himself designed the west approaches and the portico, completing the building in 1830. Consult Ellen S. Bulfinch, *Life and Letters of Charles Bulfinch* (Boston, 1896).

BULFINCH, THOMAS (1796-1867). An American author, born in Boston, Mass. He graduated in 1814 at Harvard University, was in mercantile pursuits until 1837, and subsequently was connected with the Boston Merchants' Bank. His literary reputation is based on his *Age of Fable* (1855), intended, in his own words, "to popularize mythology and extend the enjoyment of elegant literature." The book sought to connect the old Greek, Roman, Norse, and Oriental narratives with modern literature. The Norse section was derived from *Northern Antiquities* (London, 1770), a translation by Thomas Percy of a portion of the *Introduction à l'histoire du Danemark* (Copenhagen, 1755-56) by the Genoese historian Mallet. In the Greek and Roman stories ancient classical texts—in particular those of Homer, Vergil, and Ovid—were closely followed and often freely translated. His work has been a perennial favorite, both as schoolbook and general manual, has appeared in a revision (1881) by Dr. E. E. Hale, and was the acknowledged source of a considerable part of the material of another

similar volume—*The Classical Myths in English Literature*, edited by C. M. Gayley (Boston, 1894; later revised and enlarged). Bulfinch was a friend of H. W. Longfellow. He published also: *Hebrew Lyrical History* (1853); *The Age of Chivalry* (1858); *The Boy Inventor* (1860); *Legends of Charlemagne* (1862); *Poetry of the Age of Fable* (1863); *Oregon and Eldorado* (1866).

BÜLFINGER. See BILFINGER.

BULGARIA. An independent kingdom in the eastern section of the Balkan Peninsula. It is situated approximately between lat. 41° and 40° 45' N. and long. 22° 20' and 28° E. Its area after adjustments following the Balkan War of 1912-13 aggregated 43,300 square miles, amounting to an increase of 16 per cent. See Map of BALKAN PENINSULA.

The western boundary of the country as revised by the treaties of 1913 starts at Sveti Stefan, a town north of Varna on the Black Sea, and extends in a northwest direction to a point near the intersection of the Danube and the 41th parallel of latitude between the towns of Rustchuk and Tutrahan. It then assumes a westerly course along the southern bank of the same river until the point of confluence with the Timok River is attained. The eastern boundary begins here and sweeps to the south to a point in the neighborhood of Lake Dorian. At this point the southern boundary first assumes a due easterly course, then turns 90° southward to the Aegean so as to attain the sea slightly east of Kavala. It now follows the coast to the mouth of the Maritza, then strikes northward beyond Suflî to the old Turco-Bulgarian frontier so as to leave Adrianople and Demotica to Turkey, while Mustafa Pasha becomes Bulgarian. From this neighborhood the southern boundary extends eastward to the Black Sea, which is reached at Sveti Stefan.

Bulgaria can be divided into three great natural regions which succeed each other from north to south in three east-west strips. The Bulgarian section of the valley of the Danube is the most northerly of these divisions. It is followed by the mountainous country formed by the Balkan ranges. The low land lying between eastern Rumelia and the Aegean constitutes the third natural region.

The Balkan Mountains divide the country into two well-defined climatic zones. Northern Bulgaria, or the region lying between the Danube and these mountains, has a cold climate. Its sky is almost always foggy. Its winters are severe and of lengthy duration. Southern Bulgaria, however, has been endowed with a temperate climate throughout its entire extension from the Balkans to the Aegean. All these zones abound in natural resources. The valleys of the Danube and the Maritza are considered the most fertile of the Balkan Peninsula. The mountainous districts of the Balkans and the Rhodope Mountains are known to contain ores in great variety. Vast forests cover their northern flanks. The oak, ash, and beech grow here in profusion. Pine trees are met at about 4500 feet elevation. The region is especially noted for its walnut trees, which provide raw material for the thriving Austrian cabinetmaking industry.

The valleys of the southern slopes constitute the European locality, in which the rose is most extensively cultivated for its essence. Travelers

fondly recall how on emerging on a spring day from the foothills to the plain the prevailing light breezes suddenly became fragrant with the scent of roses adorning thousands upon thousands of bushes. The Kezanlik valley is sometimes called the "valley of roses" on this account. About 9000 pounds of essence are produced annually, and the principal exports are from this and the Karlovo valley. Its market value fluctuates around \$200 per pound. About 6500 pounds of rose petals are required in the preparation of a single pound of essence.

Agriculture. Like most of the Balkan states, Bulgaria is primarily an agricultural country. A fertile soil, in conjunction with a favorable climate, counteracts to some extent the effect of the primitive methods of cultivation in vogue, and the crops are generally abundant. The land is greatly subdivided among the peasantry, who cling tenaciously to their small holdings; they are ignorant and suspicious, and obstinately averse to the introduction of modern methods and machinery. The land belongs nominally to the government, and its occupants may hold it in perpetuity, paying the government a certain rent in the form of a tax; the only exception is in the case of woodland and pasture land, which are held in common by the communes and are shared by all members without payment to the government. The distribution of the soil by great classes is given below for three years, in hectares:

	1899	1908	1909
Cereals	1,877,616	2,313,521	2,394,253
Industrial plants	15,891	15,477	13,215
Potatoes, etc.	32,942	72,752	60,259
Melons, etc.	23,444	27,329	25,231
Legumes	8,449	9,194	11,088
Forage plants	440,859	512,485	523,371
Orchards and gardens	4,762	7,635	8,277
Vines	110,943	86,434	85,240
Rose fields	5,094	7,348	7,621
Total	2,520,401	3,053,931	3,130,279
Fallow .....	.....*	638,400	742,498
Total	2,520,401	3,692,331	3,872,777

* Not stated.

Rotation of crops and the utilization of natural or commercial fertilizers are little practiced. Good and bad years determine the yield, rather than intelligent methods; but the indomitable energy and thrift of the peasant help to balance the scale. The table below exhibits details of the cereal crop in 1909 and 1912, hectares harvested and metric quintals yielded:

	Hectares		Quintals	
	1909	1912	1909	1912
Wheat	1,040,140	1,120,500	8,728,359	17,350,000
Rye	201,542	215,000	1,754,248	3,150,000
Barley	241,206	260,000	2,029,568	4,000,000
Oats	196,841	180,000	1,358,037	1,750,000
Corn	607,455	650,000	5,200,122	14,000,000
Rice	3,904	3,000	51,827	30,000

Sericulture, once an important industry, is being revived after a long decline. Grapes of an excellent quality are cultivated all over the country, but the wine produced is poor, owing to the careless and antiquated methods employed in its production. The mineral lands, as well as the agricultural, belong to the state, which

works some of the coal mines on its own account, obtaining over 125,000 tons of coal annually. Besides coal, salt is also mined, and stone is quarried. Iron is found in large quantities, and gold, silver, lead, and copper also exist. Sugar refineries are operated by foreign capital.

Commerce and Transportation. The chief exports of the country are grain, animals and their products, tobacco, fruits, cloth, and attar of roses. The imports consist mostly of textiles, metal products, arms, petroleum, and coal. The trade is mostly in the hands of Greeks, Austrians, Rumanians, and Jews, and the countries participating in it most are Austria-Hungary, Germany, Great Britain, France, and Turkey. The development of the foreign trade is set forth in the table below, which shows in leva the value of imports, of exports, and of the cereal exports, for comparative years:

	Imports	Exports	Ex. cereals
1879*	32,137,800	20,092,854	.....
1891	81,348,150	71,065,085	53,430,400
1899	60,178,079	53,467,099	32,801,200
1905	122,249,938	147,960,688	101,150,300
1909	160,429,624	111,433,683	67,884,700
1910	177,356,723	129,052,205	80,811,200
1911	199,345,000	184,634,000	129,390,000

* Northern Bulgaria only.

Bulgaria has seven seaports and nine river ports, with a total shipping of 4,951,452 tons entered and 4,934,559 tons cleared in 1911. The chief financial institution of Bulgaria is the National Bank, with headquarters at Sofia and branches at the more important towns. It has a capital of 10,000,000 leva and the right to issue gold and silver notes not exceeding 13,000,000 leva. Capital of the Agricultural Bank at end of 1910, 42,845,403 leva; reserve, 5,589,695. Including the railways of Eastern Rumelia, the total length of lines in operation in 1913 was 2233 kilometers (1388 miles), state-owned; under construction, 386 kilometers. Sofia, the capital, is connected by rail with Constantinople and the chief centres of continental Europe.

Bulgaria's importance as a European nation is due chiefly to the fact that one of the world's main highways of trade traverses its territory. Railways connecting Europe and Asia must pass through Bulgaria if they are to follow the shortest route. Sofia, Philippopolis, and the Maritza valley lie on this line. Bulgarian trade is chiefly routed via the Danube or the seaports of Varna and Burgas on the Black Sea and Dedeagach on the Aegean. The Danube forms an avenue of trade with Austria-Hungary, with which Bulgaria is closely connected commercially.

Government. Bulgaria is a constitutional hereditary monarchy; proclaimed Oct. 5, 1908, by Prince, subsequently King, Ferdinand an independent kingdom, and recognized by the Powers in April of the following year. Eastern Rumelia, originally an autonomous province of the Ottoman Empire and administered by a Christian governor appointed by the Turkish government, was in 1885 incorporated with Bulgaria. The constitution of Bulgaria, adopted in 1879, and amended in 1893 and 1911, places the executive power in the hands of the king, while the legislative power is shared by him with a national assembly, the Sobranje, which

consists of a number of deputies—one for every 20,000 of the population—elected by universal manhood suffrage (in 1913 the deputies numbered 213). All legislative measures passed by the assembly must receive the sanction of the king to become laws. The initiative may be taken both by the king and by the assembly. In extraordinary cases a grand assembly (Great Sobranje) is convened, consisting of double the number of deputies of the ordinary assembly and elected in the same manner. The cabinet is responsible both to the king and to the assembly and is divided into eight departments. For administrative purposes Bulgaria, before the acquisition of territory from Turkey and the loss of territory to Rumania in 1913, was divided into 12 departments, or *okruzi*, subdivided into 71 districts, or *okolia*. All are administered by local councils elected by the people.

For the administration of justice there are district courts and justices of the peace. There are also three courts of appeal; and a supreme court at Sofia, the capital.

Education. Primary education is free and nominally compulsory between the ages of 8 and 12. The cost of maintaining the schools is covered by the state and by the municipalities and communes. There were, in 1908-09, 59 infant schools (68 teachers, 3289 pupils), 4735 elementary and 334 superior primary schools (9945 and 2111 teachers, 435,918 and 53,023 pupils), 27 special schools (244 and 3964), 113 technical and professional (273 and 4924), and 2 establishments for abnormal children (12 and 82). The university at Sofia had 58 instructors and 1569 students in 1908-09.

Finance. The monetary unit is the lev, par value 19.295 cents. The revenue is derived chiefly from direct and indirect taxes and from taxes on commerce and industries.

Below are shown the total general revenue and expenditure, and service of the public debt, in leva:

	Rev.	Expend.	Debt charge
1879	29,062,865	19,680,689	55,535
1890	83,146,469	83,602,035	3,471,307
1900	120,380,852	109,552,447	4,366,347
1909	199,919,268	190,833,599	2,150,882

The public debt stood, Jan. 1, 1912, at 623,346,807 leva: 1910, 517,984,709; 1900, 182,605,500; 1890, 76,303,000.

Army and Navy. Military service is obligatory for every able-bodied male resident (Mohammedans excepted), while those unfit for active service are obliged to pay an annual tax ranging from 10 to 4000 leva for 20 years. The period of actual service is two years in infantry regiments and three years in other arms. The annual conscript contingent was fixed for 1911 at 35,340 men. The peace establishment in 1912 was 3807 officers and 57,491 others; war effective, 190,452. The navy consists of a few steamships of from 400 to 800 tons, a few torpedo boats and gunboats for the defense of the Danube, and several small steamboats.

Population. The Bulgarians, who constitute the bulk of the population of Bulgaria, are a different people from the ancient Bulgars who settled in the region 12 centuries ago (see paragraph on *History*). Linguistically they constitute a branch of the South Slavic stock (see

BULGARIAN LANGUAGE). They may now be termed an ethnic group, made up of Slavic (Teuto-Slavic), Gothic (Teutonic), and Mongoloid (Finno-Tatar) elements, to which Mussulman and Greek have added a considerable percentage. About three-eighths of the Bulgarian people live outside of Bulgaria—in Turkey, Russia, Rumania, and Austria-Hungary. The bulk of them belong to the Bulgarian church; but there are several hundred thousand Mohammedan Bulgarians, called "Pomaks," who are found mainly in the Rhodope Mountains, and certain districts near Lovech and Plevna.

The population of Bulgaria, including Eastern Rumelia, was 3,310,713 in 1892, 3,744,283 in 1900, 4,028,239 in 1905, and 4,337,513 in 1910, (estimated in 1920, 4,800,000). Racially the population was divided in 1910 into 3,497,794 Bulgarians, 466,117 Turks, 121,435 Gypsies, 79,787 Rumanians, 43,273 Greeks, 40,118 Jews, 21,145 Pomaks, 18,050 Tatars, 12,914 Armenians, etc. The constitution guarantees religious freedom; but the Bulgarian is recognized as the national church, and numbers among its adherents by far the larger part of the population, including the royal family. The clergy of both the national and the other churches are paid by the state. Next to the Bulgarian church, with 80.6 per cent of the population, the Mohammedan has the largest number of adherents, 17.2 per cent.

History. Modern Bulgaria includes the greater part of the Roman Province of Mœsia and a portion of Thrace. At the time of the great migration of nations which overwhelmed the Roman Empire of the West, the Slavs pressed forward into this region, pushing aside the Germanic invaders who had preceded them (fourth and fifth centuries A.D.). About the close of the fifth century A.D. the Bulgars, a people of Finnic stock, probably akin to the Huns, whose early home appears to have been the steppes of southeastern Russia, begin to make their appearance in the region of the lower Danube, and in the reign of Justinian (525-565) they figure among the enemies of the Byzantine Empire. Towards the close of the seventh century they pushed across the Danube and occupied Lower Mœsia, where they erected a strong and warlike state, which narrowed the boundaries of the Byzantine Empire, and for a time even threatened its existence. Not being numerically powerful enough to attack the Slavic and other elements in the region which they had occupied, the Bulgarians gradually became merged in the subjected population, and a Slav-Bulgarian people was evolved out of the admixture. About 862 their khan was converted to Christianity. The Bulgarians borrowed much from their Greek neighbors. The Bulgarian realm attained a high pitch of power at the beginning of the tenth century under Symeon, or Simeon, who assumed the title of Czar; his dominions extended from the Black Sea to the Adriatic, from Thessaly to the land of the Carpathians. Soon after a disruption of the realm into two parts took place, as the result of religious feuds. The eastern half was conquered by the Byzantine Emperor, John Zimisces, and the western succumbed in 1018 to the arms of the Emperor Basil II. In 1186 the Bulgarians, under the lead of John Asen, revolted against the Byzantine rule and established a new realm, the capital of which was Tirnova. This soon rose to be a powerful

state (see *ASEN*); but after a time it was outstripped by Serbia, which in the middle of the fourteenth century was the great Slavic power of the South. In 1354 the Ottoman Turks first obtained a foothold in Europe, and their conquest of Adrianople in 1361 brought them close to the frontiers of Bulgaria. In 1388-93, under Amurath I and Bajazet I, they overran and conquered the country and sacked and burned Tirnova. The prostrate Bulgarian nation ceased to have a history of its own until the latter half of the nineteenth century.

In 1876 a slight revolt broke out among the Bulgars against the intolerable oppression and misrule of the Ottoman government. Its immediate occasion was the settlement among the peaceful peasantry of Circassians, who made the native population the victims of brutal barbarity. The Bashi-Bazuks, an irregular police enrolled by the Turkish commander to put down the revolt, were largely composed of these alien colonists, and the suppression of the rebellion was accompanied by the most horrible outrages. The "Bulgarian atrocities" shocked the civilized world and gave Russia the excuse she had been seeking for declaring war on Turkey. Bulgaria was the principal theatre of the war of 1877-78. (See *RUSO-TURKISH WAR*.) Russia hoped to bring all of the Slav peoples of the Balkans under her hegemony; and, by the Treaty of San Stefano, Bulgaria was made an autonomous principality tributary to Turkey, with boundaries wider than those of the ancient kingdom and a coast line on the *Ægean*. The Powers, at the Congress of Berlin (q.v.) (1878), refused to allow such a great curtailment of the Turkish territory, but made Bulgaria north of the Balkans an autonomous principality, tributary to Turkey, with a prince to be elected by the people, subject to the confirmation of the Porte with the assent of the Powers. The Province of Eastern Rumelia, to be administered by a Christian governor, was erected south of the Balkans, out of part of the territory which the Treaty of San Stefano had included in Bulgaria. (For terms of the Treaty of San Stefano, see *BERLIN, CONGRESS OF*.) Alexander of Battenberg (q.v.) was the first Prince of Bulgaria under this settlement. An outburst of Bulgarian national spirit brought about in 1885 a revolution, by which Eastern Rumelia united itself to Bulgaria. The protest of the Porte received no encouragement from the Powers. Russia alone opposed the union, because of what it regarded as the ungrateful spirit of independence shown by the Bulgarian people, who had taken up the problems of their newly recovered national life with an unexpected spirit and vigor. The bitter struggle between the Russian party and the Nationalists has since complicated the political life of the principality. Another opponent of the aggrandizement of Bulgaria was found in her neighbor and ancient rival, Serbia, which put an army into the field to oppose the union by force. In a short and sharp campaign in the closing months of 1885, Prince Alexander and the Bulgarian troops defeated the larger Serbian army and were only restrained from invading Serbia by the intervention of Austria-Hungary. Prince Alexander, after a shameful conspiracy against him excited by Russian intrigues, abdicated the crown in September, 1886, in the hope that it would lead to a more friendly attitude on the part of Russia, and Prince Ferdinand of Coburg was

chosen to succeed him in July, 1887. Russia, which had opposed the election of Prince Ferdinand, withheld its recognition of his title to the throne, as did the other great Powers. Nevertheless, Ferdinand maintained himself in his position, owing mainly to the ability of his Premier, Stambuloff. The fall and subsequent assassination of Stambuloff (July, 1895) paved the way for a better understanding with Russia; and when Ferdinand consented to have his son, Boris, received into the Greek church (Feb. 14, 1896), Tsar Nicholas II formally acknowledged Ferdinand as Prince of Bulgaria. This step was followed by the recognition of Ferdinand on the part of the other European Powers. The national aspirations of the Bulgarians continued throughout this period to be directed towards the incorporation into their principality of those portions of Thrace and Macedonia of which the Congress of Berlin in 1878 had deprived them. An insurrection of Bulgarians in the Turkish vilayet of Monastir in 1903 aroused the fighting spirit of the nation, and actual war between Bulgaria and Turkey was then prevented only by the threats of the rival Serb and Greek nationalities in Macedonia and the mediation of the Powers. From 1903 to 1908 the Powers proposed numerous but futile programmes of reform whereby Turkey should maintain her sovereignty over Macedonia and Thrace, but the Christian subjects, especially the Bulgars, should secure a certain share of local autonomy.

Meanwhile the principality of Bulgaria had been making rapid progress; the healthy development of agriculture and trade had promoted the economic prosperity of the people, and improvements in military organization had provided Bulgaria with what was reputed to be the best army in southeastern Europe. In the face of these facts it was humiliating to the patriotic Bulgarians that their state should still be reckoned a vassal of the Ottoman Empire, while Greece, Rumania, Serbia, and even Montenegro were recognized as independent states. When, in September, 1908, the Bulgarian minister at Constantinople, M. Ivan Gueshoff, was not invited to a dinner tendered to the diplomatic corps on the ground that he was only an agent of a tributary state, popular fury in Bulgaria reached an unprecedented pitch. Taking advantage of this feeling, as well as of the dissensions within the Ottoman Empire occasioned by the Turkish Revolution of 1908 (see *TURKEY*) and the international complications created by the annexation of Bosnia and Herzegovina by Austria-Hungary, Prince Ferdinand utilized the thirtieth anniversary of the establishment of the autonomous Bulgarian principality to proclaim at Tirnova, the capital of the ancient Bulgarian Kingdom, on Oct. 5, 1908, the complete independence of his country and the indissoluble union of Bulgaria and Eastern Rumelia. After protracted negotiations and a guarantee on the part of Russia to advance to Bulgaria the difference between the \$24,000,000 claimed by Turkey in lieu of the Eastern Rumelian tribute and the \$7,600,000 which Bulgaria herself was willing to pay, the Powers and likewise Turkey recognized in 1909 the independence of Bulgaria and the new title "King of the Bulgars" which Prince Ferdinand had assumed. In 1911 Crown Prince Boris was formally recognized as heir to the new kingdom and at the same time was betrothed to

the Grand Duchess Olga, eldest daughter of the Tsar of Russia.

In general, internal questions were now subordinated to foreign politics. M. Alexander Malinoff, the Democratic leader and Premier from 1908 to 1911, failed to effect desirable electoral reforms, and M. Ivan Gueshoff, who formed a coalition cabinet of Nationalists and Progressists (March, 1911), preferred to press forward the policy of a Greater Bulgaria. Since the Turkish Revolution of 1908 the centralizing tendencies of the Young Turk ministry had caused repeated outbreaks of the Christian peoples in Macedonia and Thrace, and for the first time in history the Bulgarians found it possible and advantageous to make common cause with Greeks and Serbs against the Turks. While the Turco-Italian War (q.v.) was in progress, the Bulgarian government signed a secret treaty of defensive and offensive alliance with that of Servia (March, 1912) and shortly afterward reached an amicable understanding with Greece. The result was the Balkan War of 1912-13 (q.v.), in the first part of which, that between Turkey on one side and the Balkan Allies—Bulgaria, Greece, Servia, and Montenegro—on the other, the Bulgarians acquitted themselves admirably. They won the greatest battle of the war at Lule Burgas, captured Adrianople, and pushed the Turkish army within a few miles of Constantinople. By the Treaty of London (May 30, 1913) Turkey agreed to cede to the Allies all territory on the European mainland west of a line drawn from Enos to Midia. Then followed bitter and unseemly, though quite natural, quarrels among the Allies over a division of the spoils. Not only did Bulgaria claim Saloniki as against Greece, and Monastir as against Servia, but she was unwilling to indemnify Rumania for her neutrality throughout the struggle by any cession of territory whatsoever. M. Gueshoff, whose policy was deemed too conciliatory, was retired from the premiership in favor of the uncompromising Dr. Daneff, who, upon assuming office in June, 1913, found the treasury exhausted, the harvests spoiling for want of reapers, and foreign relations in confusion. Unwilling to avoid war by concession, and unable by diplomacy to gain an ally, the new Premier involved Bulgaria in the second part of the Balkan War (q.v.), this time with Greece, Servia, and Montenegro, and with Rumania and Turkey as well. The Bulgarian defense collapsed before the onslaught of such numerous enemies, and it was charged that the *débâcle* was due largely to the failure of the ministry to work in harmony with the generals in the field. On July 15, 1913, in the midst of the lamentable contest, Dr. Daneff was replaced by Dr. Radoslavoff, who at once undertook to obtain peace at any cost. The upshot of the whole matter was two treaties: (1) that of Bucharest (Aug. 10, 1913), by which Bulgaria ceded to Rumania the strip of territory adjacent to the Dobrudja north of a line drawn from Turtukai to Balchik, and abandoned Kotchana and Monastir to Servia, and Saloniki, Doiran, Demir-Hissar, Seres, Drama, and Kavala to Greece, retaining in Macedonia and Thrace the town of Strumnitza and some 60 miles of seacoast on the Ægean between the mouths of the Mesta and Maritza; and (2) that of Constantinople (Sept. 29, 1913), by which the new Turco-Bulgarian boundary was traced up the Maritza to a point near Mandra, thence, passing west of Demotika,

left both that town and Adrianople to Turkey, and thence bent eastward, passing north of Kirk-Kilisseh and terminating on the Black Sea at Sveti Stefan. Disappointed in the results of the Balkan War, Bulgaria awaited an opportunity to avenge herself and this was promised on the occasion of the Great War in 1914, when the Entente and Central Powers both bid for her support. For more than a year Bulgaria hesitated between them, and then, Oct. 8, 1915, threw herself on the side of the latter. After the victory of the Entente Allies, she was forced to submit to the treaty of Neuilly, Nov. 27, 1919, which in addition to strict measures in respect to disarmament deprived her of her Ægean littoral and other territory. After the surrender King Ferdinand abdicated and was succeeded by Boris III, Oct. 3, 1918. For details during the war and later, see SUPPLEMENT.

Bibliography. For a general description, consult: Kanitz, *Donaubulgarien und der Balkan* (Leipzig, 1882); Tuma, *Die östliche Balkanhalbinsel, militär-geographisch, statistisch und kriegshistorisch dargestellt* (Vienna, 1886); Samuelson, *Bulgaria, Past and Present* (London, 1888), perhaps the best comprehensive account to that date in English; Jireček, *Das Fürstentum Bulgarien* (Vienna, 1891); P. Lindenberg, *Das neue Bulgarien, 1887-1912* (Berlin, 1912). For the most authoritative history of Bulgaria for the period up to 1876, consult: Jireček, *Geschichte der Bulgaren* (Prague, 1876). For the later history: Huhn, *The Struggle of the Bulgarians for National Independence under Prince Alexander*, trans. (London, 1886); id., *The Kidnapping of Prince Alexander of Battenberg*, trans. (London, 1887); Koch, *Prince Alexander of Battenberg* (London, 1887); G. Sonjeon, *Histoire de la Bulgarie depuis les origines jusqu'à nos jours 485-1913* (Paris, 1913). Consult also: Battenberg, *Die volkswirtschaftliche Entwicklung Bulgariens von 1879 bis zur Gegenwart* (Leipzig, 1891); Beaman, *Twenty Years in the Near East* (London, 1898); Falkenegg, *Aus Bulgariens Vergangenheit und Gegenwart* (Berlin, 1900); Dicey, *The Peasant State* (London, 1894); Miller, *The Balkans—Rumania, Bulgaria, Servia, and Montenegro* (New York, 1908); *Travels and Politics in the Near East* (1899); MacGahan, *The Turkish Atrocities in Bulgaria* (London, 1876); H. Bernard ed., *Shade of the Balkans* (London, 1904); Durham, *Burden of the Balkans* (New York, 1905); Villari ed., *The Balkan Question* (ib., 1905); Launay, *La Bulgarie d' hier et de demain* (Paris, 1912); H. Wagner, *With the Victorious Bulgarians* (London, 1913); *L'unité de la politique Bulgare* (Paris, 1920).

BULGARIAN BACILLUS. See AUTO-INTOXICATION.

BULGARIAN LANGUAGE. A language spoken by nearly 5,650,000 people and belonging, with the Church Slavonic, Serbian, and Slovenian, to the southern group of Slavic languages (q.v.). Although it stands with the other languages that do not possess the so-called *Voll-laut*, it shares with the Russian its lack of syllabic quantity, besides possessing a peculiar accent of its own. The ancient nasals have become obscure, indefinite sounds. Most striking in morphology is the postpositive use of the article at the end of the noun. Of declension in modern Bulgarian there is but little, the adjectives having lost their degrees of comparison; in conjugation only

the present tense remains, all the other forms being periphrastic. Lexically it shows that it has been much influenced by the Turkish, Albanian, Serbian, and Rumanian languages. In reality there is no Pan-Bulgarian language as such. There is a great variety of dialects, which fall into three groups—Southern Thracian, Rhodopian, and Western Macedonian. The written language used in antiquity was the Church Slavonic, or a dialect closely resembling it, and known as "Old Bulgarian." The "Middle Bulgarian" dates from the twelfth century. The Turkish yoke caused a long interruption in the development of the language, which lasted close to the nineteenth century. Some of the modern writers have used the Church Slavonic forms, while others have preferred the popular speech. Of late the majority of writers have been inclined to favor the Danubian dialect. The Cyrillic alphabet is used, and the system of spelling has been modeled on the phonetic Serbian spelling of Karajich. The best grammars are those of Kyriak Cankov (Vienna, 1852) and Morfill (London, 1897), and the best dictionaries those of Bogorov, Bulgarian-French, and French-Bulgarian (Vienna, 1869), and Duvernois, Russian-Bulgarian (Moscow, 1885-89). A German-Bulgarian dictionary was published by Miladinov (Sofia, 1897). Consult: Markov, *Dictionnaire de poche bulgare-française et française-bulgare* (Leipzig, 1912); Miletič, *Die Rhodopemundarten der bulgarischen Sprache* (Vienna, 1912).

BULGARIAN POLITICAL PARTIES. See POLITICAL PARTIES, *Balkan States*.

BULGARIN, bōōl-gā'rīn, FADDAY VENEDIKTOVITCH (1789-1859). A Russian author of Polish extraction, born in Lithuania. He fought in the campaign against France, but afterward served in the Polish army under Napoleon. On Napoleon's fall he returned to St. Petersburg (1820) and devoted himself to journalism, attracting considerable attention by the biting sarcasm of his articles in the daily, the *Northern Bee*, founded in 1825, to which he contributed for over 30 years. He was a servile follower of the Absolutist régime. Through his intimacy with the members of the secret police he was enabled to hurt considerably the cause of his numerous opponents. Some of Pushkin's bitterest epigrams have given Bulgarin a notoriety more lasting than the fame of his own literary efforts. Of these, *Ivan Vyshigin* (1829), with its sequel, *Peter Ivanovitch Vyshigin* (1831), *Dmitry* (1830), and *Mazeppa* (1834) were much in vogue in their time. In 1837 he published under his own name the work of N. A. Ivanoff, professor at Dorpat, *Russia in her Historical, Statistical, Geographical, and Literary Aspects* (6 vols., St. Petersburg). Bulgarin published also *Literary Papers* (1823-24), the *Children's Companion* (1826-27), and other things of uneven merit.

BULGARIS, bōōl-gā'rēs, DEMETRIUS (1803-78). A Greek statesman, born at Hydra. He fought in the Greek War of Independence, and in 1831 was one of the opponents of Capo d'Istria, and upon the downfall of the latter conducted the Ministry of Marine. He resigned his position upon the arrival of King Otho, but after the revolutionary movement of 1843 resumed his political activity as a member of the Senate. In 1847 he became Minister of Marine, in 1848 Minister of Finance, and after the Crimean War he was appointed president of the cabinet, in which

capacity he restored order and conciliated the Powers. Afterward he became one of the foremost opponents of the Bavarian dynasty in the Senate. Upon the outbreak of the Revolution of 1862 Bulgariis was proclaimed coregent with Rufos and Canaris, but was deposed by Canaris in 1863. He served as president of the ministry in 1863-64, 1865, 1866, 1868, 1871, 1874.

BULGARIS, EUGENIOS (1716-1806). A Neo-Greek educator and theologian. He was a teacher at Janina (after 1750), and director of the academy on Mount Athos from 1753 to 1758, when he was compelled to resign owing to Turkish intrigues. After conducting a similar academy in Constantinople for two years, he was again compelled to renounce his position and went to Berlin. Here Frederick the Great gave him a letter of introduction to Catharine II of Russia, who appointed him Archbishop of Slovensk and Kherson. He prepared several valuable textbooks in metaphysics and logic, made notable contributions to the theological literature of his country, and by his translations brought to the attention of the Greeks some of the best examples of European literature. His style was long accepted as a model, and his range of subjects was extensive. Among his original Greek works are the following: *Opinions of Philosophers* (1804); *The First Century of Church History* (1805); *Treatise on Tolerance* (1768).

BUL'GARS, or **BULGA'RIANS**. An ancient people of Ugro-Finnic stock, probably akin to the Huns. They first appear in history about the close of the fifth century A.D., at which time a part of the nation, advancing westward from the steppes of southern Russia, made its appearance in the region about the mouth of the Danube. Two centuries later they took possession of Lower Mœsia, south of the Danube, to which country they gave their name. It was once called "Little Bulgaria" in contrast with "Great Bulgaria," in the north. The descendants of these invaders became Slavized (see *BULGARIA, History*). The part of the nation which had remained behind in their old home in the Russian steppes founded a realm known as that of the Volga Bulgars. These northern Bulgars embraced Islam. The ruins of their old capital, Bulgar or Bolgara, may be seen near the village of Bulgarskoie or Uspenskoie, in the district of Spansk, Russian government of Kazan, about 4 miles from the Volga. An interesting account of these northern Bulgars is to be found in the report of Ibn Fadlan, who in 921 A.D. was sent on an embassy to the Volga by the Caliph of Bagdad. Some think the Bulgars of the Volga are represented in part by the Chuvash. Consult Westberg, *Beiträge zur Klärung orientalischer Quellen über Ost-Europa* (St. Petersburg, 1900). See *BOLGARY*.

BULGAR'US. The most celebrated of the famous "four doctors" of the law school of Bologna. He was a native of that city, and was regarded as the Chrysostom of the gloss writers. He lived to a great age, becoming childish before his death in 1166. Bulgarus was one of the most trusted advisers of the Emperor Frederick I. The commentary *De Regulis Iuris* is his most celebrated work. It was edited by F. G. C. Bechhaus (Bonn, 1856).

BULHÃO-PATO, bōō-lyoun' pā'tō, RAIMUNDO ANTONIO (1829-). A Portuguese poet, born in Bilbao. At the age of eight or nine he was taken to Lisbon. He is a pupil of Almeida-

Garrett and Herculano and a pronounced exponent of the Romantic school. He became a member of the Academy of Sciences, and, as chairman of the commission intrusted by that body with the publication of the *Monumentos inéditos*, he edited the *Cartas de Affonso de Albuquerque* (Lisbon, 1884). His independent works include the following: *Versos* (1850 and 1857); *Paqueta*, a narrative poem (1866); *Cancões da Tarde* (1867); *Flores agrestes* (1870); *Cantos e sátiras* (1873).

BULIGIN, bōo-lī'gin, ALEXANDEB GRIGOREVICH (1851-). A Russian statesman. He was educated at the Imperial Academy and after 1873 held numerous governmental posts in Russia, rising rapidly in rank and favor until in 1905 he became Minister of the Interior.

BULIMIA (Neo-Lat., from Gk. βούς, *bous*, ox + λυμός, *limos*, hunger). A term applied to the rapacious appetite manifested by the insane. It is a condition of frequent occurrence in cases of general paresis (q.v.), less often in cases of mania (q.v.). The term is also used to describe the inordinate craving for food which occurs in diabetes, hysteria, neurasthenia, and during recovery from typhoid fever. The condition may be permanent (polyphagia) or occur in paroxysms. In the insane, hysterical, or idiotic, and to a less degree in pregnancy, there is often a desire for unusual or injurious substances. This is termed *pica*; when the desire is for articles of a disgusting or repulsive nature, it is known as *coprophagy*. Bulimia is sometimes due to a natural physical demand for food, as in growing children, and during recovery from acute febrile disease. But in abnormal mental states it is partly psychical and partly due to anæsthesia of the stomach. There is an absence of the sense of satiety, technically known as *acoria*.

BULIMUS. A genus of land snails (see SNAIL) having an elongated spiral shell with a thickened reflected lip and often handsomely ornamented. Most of the 300 or more species are tropical and belong to South America, where they are found mainly on trees and bushes. "Most of the species are large, some being among the giants of the pulmonates, only exceeded by the Achatinæ. [See AGATE SHELL.] The largest species is *Bulimus ovatus*, which is common in the forests of southern Brazil; the shell reaches a length of 6 inches. This species is an article of food. Its eggs are also large; they have a white shell and equal in size those of a pigeon." Several species occur along the southern border of the United States. See PLATE of SNAILS.

BULKELEY, būk'li, MORGAN GARDNER (1838-1922). An American financier and politician. He was born in East Haddam, Conn., was educated in Hartford, and became a merchant in Brooklyn, N. Y. In 1872 he returned to Hartford and was president of the United States Bank until 1879, when he accepted the presidency of the *Ætna Life Insurance Company*. He was mayor of Hartford for eight years (1880-88) and in 1889 became Governor of Connecticut. At the election in 1891 no candidate received a constitutional majority, so that Governor Bulkeley continued to act as the executive until 1893. He was United States Senator from 1905 to 1911.

BULKELEY, PETER (1583-1659). An American Colonist, the founder and first minister of Concord, Mass. He was born in Bedfordshire, England, the son of a Nonconformist minister;

was educated at St. John's College, Cambridge, where he was for some time a fellow, and for 21 years was rector of a parish in Bedfordshire. To secure greater freedom of worship he emigrated to America in 1635 and settled at Cambridge, Mass. In the same year "he carried a good number of planters with him up further into the woods" (Mather's *Magnalia*, vol. i, p. 400) and founded Concord, where he remained as "teacher" and pastor until his death. He was a profound theologian, a good classical scholar, and, according to Cotton Mather, had throughout life "a competently good stroke at Latin poetry" (*Magnalia*, vol. i, p. 403). He wrote some English verse, including an elegy on Thomas Hooker (published in Morton's *New England Memoriall*), and a learned theological work entitled *The Gospel Covenant; or, the Covenant of Grace Opened* (1646)—"one of those massive, exhaustive, ponderous treatises," says Tyler, "into which Puritan theologians put their enormous biblical learning, their acumen, their industry, the fervor, pathos, and consecration of their lives" (Tyler, *History of American Literature*, New York, 1878). Consult an interesting sketch in Mather's *Magnalia* (London, 1702), and an article, "Life and Times of Rev. Peter Bulkeley," in the *New England Historical and Genealogical Register*, vol. xxxi (Boston, 1877).

BULKHEAD (*bulk* or *balk*, Ger. *Balke*, beam, bar). The name given to a variety of constructions in civil and marine engineering. In tunneling a bulkhead is a vertical partition of timber or masonry intended to prevent the passage of water, air, or mud. Tunnel bulkheads may be made solid or they may be provided with a door to give passage to workmen and materials. In harbor work the term "bulkhead" is often applied to the sea wall which marks the shore line, and from which the piers or quays project out into the water.

On shipboard a bulkhead is a partition separating the compartments of a ship. In modern vessels bulkheads are chiefly of steel, like the rest of the hull. All vessels are now divided into several compartments by water-tight bulkheads as a matter of safety, so that the breaching and consequent filling of one compartment with water need not necessarily cause the ship to founder. Water-tight bulkheads are both transverse and longitudinal, the former dividing the ship into several great compartments, and the latter subdividing these. In addition to the main bulkheads, many parts of warships, like magazines, shell rooms, etc., are especially inclosed. In merchant vessels the principal transverse bulkheads are without any holes through them below the water line; but in men-of-war the necessity for communication below has necessitated the cutting of doors which are designed to be water-tight, but many of them are probably not wholly so. In ships having two or three screws, the engines for each are often in separate compartments, the boilers are placed in one or more compartments, and the coal bunkers are divided into several. In most merchant vessels a *collision bulkhead* is fitted a short distance from the stem, and several steamers have been saved by it from foundering. See SHIPBUILDING.

BULKLEY, būk'li, LUCIUS DUNCAN (1845-). An American physician. He was born in New York and was educated at Yale (1866), and at the College of Physicians and Surgeons, New York (1869), and afterward took a supplement-

tary course in dermatology abroad. In 1901 he was attending physician at the New York Skin and Cancer Hospital, at the Hospital for Ruptured and Crippled, and at the Manhattan Eye and Ear Hospital. He was also consulting physician at the New York Hospital, and dermatologist at the hospital on Randall's Island. The following are some of his principal publications: *Acne and its Treatment* (1885); *Syphilis in the Innocent* (1849); *Manual of Diseases of the Skin* (1898); *Eczema and its Treatment* (1901); *Compendium of the Diseases of the Skin* (1912); *Diet and Hygiene and Diseases of the Skin* (1913).

BULL (Lat. *bulia*, anything round or swelling, a boss, knob). A seal of metal, usually lead, appended to a document to prove its authenticity. A bull is round, with an inscription on each face, and has the general appearance of a coin. Such bulls were used by Roman emperors, Frankish kings, and other monarchs in the early Middle Ages; gradually they passed out of use in Germany, France, and England, but were used in southern countries where seals of wax did not keep well. For important public documents golden bulls were sometimes used, e.g., the Golden Bull (q.v.) of the Emperor Charles IV (1356); silver and other metals were used only rarely. At the present day bulls are chiefly used for papal documents, for which they have been employed from a very early period, and the name is now applied exclusively to documents put forth in the name of the Pope. They are issued by the Apostolic Chancery and differ in several particulars from briefs. (See **BRIEF**.) In cases of granting favors the seal is appended to the open letter by a yellow or red silk cord, but in the administration of justice a gray cord is used. The Gothic character was used for bulls as distinguished from briefs down to Dec. 29, 1878, when Leo XIII ordered the use of the ordinary character. At the same time he restricted the use of the very ancient leaden seal previously employed to the more important bulls, replacing it for other cases by a simple red one stamped on the parchment. All bulls begin with the name of the Pope, followed by the title *Servus servorum Dei*. The greeting is followed by a general introduction, the first words of which are usually adopted to designate the bull; e.g., the bull *Ersurge Domine*, issued by Pope Leo X and burned by Luther; *In Cena Domini*, the celebrated declaration against heretics, first issued by Urban V in 1362; the famous *Unigenitus*, which condemned Quesnel in 1713; *Dominus ac Redemptor noster*, which abolished the Jesuits, and *Sollicitudo omnium*, which restored them; *Ineffabilis*, which proclaimed the doctrine of the Immaculate Conception in 1854; and *Pastor æternus*, which defined the papal infallibility in 1870. The fullest collection of papal bulls is that begun by Coqueelines (28 folio vols., 1739-44) and continued by Barberi and Gaude. There are many general or special collections. For the general subject, consult Giry, *Manuel de diplomatique* (Paris, 1894).

BULL. A ludicrous and unintentional blunder in speech due to the conjunction of contradictory or incompatible ideas. Some would trace the origin of the term to the papal bulls, in which the Pope styles himself "the servant of servants," yet claims spiritual authority over the world, but there is no ground for this supposition. The following aphorism, ascribed to

a soldier who had run away, is a good illustration of a bull: "Well, it's better to be a coward for a few hours than to be dead all the rest of your life!" The Irish are noted for their bulls. Consult Edgeworth, *An Essay on Irish Bulls* (London, 1802). See **ROCHE**, SIR BOYLE.

BULL. See **OX**.

BULL, CHARLES STEDMAN (1846-1911). An American physician, born in New York City and educated at Columbia University and at the College of Physicians and Surgeons (1868). He was house physician and surgeon at Bellevue Hospital and then studied in Vienna, Heidelberg, Berlin, Utrecht, Paris, and London, and was a pupil of Von Arlt, Graefe, and Donders. He was professor of ophthalmology in Cornell University Medical College and consulting ophthalmic surgeon to the Presbyterian, St. Luke's, and St. Mary's hospitals, New York. Dr. Bull was ranked among the greatest oculists of his time. He was president of the American Ophthalmological Society in 1903-07. He wrote a number of medical works, among which are the following: *Choroiditis Following Cerebro-Spinal Meningitis* (1873); *Influence of the Fifth Nerve in Iritis and Choroiditis* (1876); *Symptomatology and Pathology of Intracranial Tumors* (1875). He edited the third and fourth editions of J. Soelberg Wells's *Treatise on Diseases of the Eye*, to which subject he also contributed numerous original papers.

BULL, GEORGE (1634-1710). An English theologian. He was born at Wells and studied at Oxford, whence he retired in 1649, having refused to take the Commonwealth oath. He took holy orders in 1655 and was appointed pastor of St. George's, Bristol; later he had the two parishes of Suddington. In 1669 he published his *Harmonia Apostolica*, a reconciliation of Paul and James on justification. Bull published an answer to criticisms of the *Harmonia* in 1675. In 1678 he was made prebendary in Gloucester Cathedral and rector of Avening, Gloucestershire, and in 1679 archdeacon of Llandaff. In 1685, to vindicate himself from the charge of Socinianism, he published his *Defensio Fidei Nicænæ*, in which he gives the testimony of the anti-Nicene fathers on the doctrine of the Trinity. This was supplemented in 1694 by his *Judicium Ecclesiæ Catholicæ*, for which the thanks of the whole French clergy were sent to him through the celebrated Bossuet. In reply to Bossuet, who had expressed wonder that Dr. Bull remained out of the Church of Rome, he published *The Corruptions of the Church of Rome* (1705-07). His last work, also on the Trinitarian controversy, was *Primitiva et Apostolica Traditio* (1710). He was consecrated Bishop of St. David's in 1705. A complete edition of his works includes his sermons and his life by Robert Nelson (Oxford, 1827).

BULL, GOLDEN. See **GOLDEN BULL**.

BULL, JOHN. A popular synonym for the English people, which made its first appearance in 1712 in a popular print entitled *Law is a Bottomless Pit*. John Bull is well known in current comic periodicals as a burly country squire, impetuous, honest, narrow-minded, dogmatic, and easily imposed upon. This figure was first gradually evolved in the pages of *Punch*.

BULL, JOHN (1563-1628). An English organist and composer. He was appointed organist

in the Chapel Royal in 1591 and next year was made doctor of music by Oxford University. On the foundation of Gresham College he was appointed first lecturer in music. In 1613 he went to Belgium and in 1617 became organist to the cathedral in Antwerp, where he died. The claim that he composed the English national anthem has not been sustained.

BULL, OLE BORNEMANN (1810-80). A remarkable Norwegian violin virtuoso. He was born in Bergen, Feb. 5, 1810. He showed remarkable musical precocity. In the mountains he fiddled away for hours and hours, as his father would not tolerate the instrument in his house. Finally he broke with his parents and went to Cassel (1829) to study under Spohr (q.v.), but, not finding him congenial, he returned to Bergen. Here he practiced assiduously at his instrument until 1831, when he went to Paris. His savings were soon consumed, he fell ill, and thieves stole all his belongings, including his violin. In despair he threw himself into the Seine, but was saved, and a wealthy woman, Villemainot, who took a great interest in him, provided him with necessary comfort and a Guarneri instrument. His début (1833) was a triumph, Paganini being in the audience. A hearing of this master caused Bull to cultivate the Paganini method. With undiminished success he played throughout Germany, France, Russia, England, and Ireland, but in 1839-40 fortune turned against him. Molique overshadowed him in Paris; London and Germany were equally unkind. Disheartened, he went into retirement (1840-43) and then proceeded to America, where he won enthusiastic recognition. With the money earned here he returned to Norway and built a national theatre in Bergen, but soon quarreled with the authorities and again went to the United States (1852). He amassed a fortune, bought 125,000 acres of land in Pennsylvania, and founded a Norwegian colony, but was swindled out of his possessions and money, and in 1860 recrossed the Atlantic. His European tour in 1865-66 brought little money and evoked scant enthusiasm, for Europe had adopted new standards of violin playing. Subsequently he established a violin school of his own and repaired his fortune by several visits to the United States (1868-69, 1870-79), where he married. He bought a house in Cambridge, Mass., and during the last years of his life spent much of his time there. He died at his summer residence near Bergen, Norway, Aug. 17, 1880. Bull was a rare phenomenon in the history of music. His tone was mellow and powerful; in the matter of mere technique he rivalled even Paganini. And yet a critic could discern the self-taught musician behind this prodigious technique. His own compositions (chiefly fantasias on national themes, which he invested with a peculiar fire of his own) best exhibited his mastery over his instrument and were the favorites with his audiences. As contributions to the literature of the violin they are of little value. Consult Sara C. Bull, *Ole Bull: A Memoir* (Boston, 1883), and a biography in Norwegian by O. Vik (Bergen, 1890).

BULL, WILLIAM TILLINGHAST (1849-1909). An American surgeon, born at Newport, R. I. He graduated from Harvard University in 1869 and then studied medicine at the New York College of Physicians and Surgeons and in Europe. In 1875 he began active practice in New York City. He was demonstrator and con-

sulting surgeon in several hospitals and from 1889 until his death was professor of the practice of surgery in the College of Physicians and Surgeons. One of the most eminent surgeons in the United States, he was a pioneer in operating for appendicitis. He was also an authority on cancer, a disease which proved fatal to himself.

BULLA (Lat., boss, knob). A collection of serous fluid, situated immediately beneath the cuticle and separating the latter from the true skin. Bullæ differ from vesicles only in size, and no very definite line can be drawn between a large vesicle and a small bulla. Bullæ usually vary in diameter from $\frac{1}{4}$ inch to 2 inches. They may be followed by crusts or by ulcerations. See BLEB.

BULLACE, bul'las (Gael. *bulaistear*, bullace, sloe). A shrub or small tree (*Prunus insititia*), larger and much less spiny than the sloe (*Prunus spinosa*), but very closely allied to it, as it is also to the plum (*Prunus domestica*). The bullace may be regarded as a form intermediate between the plum and the sloe. Its leaves, however, are generally broader in proportion to their length than those of either of these, and its fruit stalks are more frequently in pairs; it differs also from both of them in its downy fruitstalks and in having the under side of its leaves permanently downy. The flowers are rather larger than even those of the plum; the fruit is larger than the sloe, is generally globose, and although it partakes in some degree both of the acidity and the astringency of the sloe, it is not unpleasant, especially after having been mellowed by frosts, and it makes excellent pies or tarts. The bullace is common in hedges, coppices, and banks in England and in many parts of Europe, but is rare in America, having escaped from cultivation in the New England and Middle States.

BULLANT, bul'an', JEAN (c.1515-78). A French architect. He first appears as a protégé of the Constable Anne de Montmorency, who is supposed to have employed him on the Château d'Écouen. He built here the two porticoes which decorate the court façades of the two lateral wings. On Oct. 25, 1557, he was appointed "Contrôleur des bâtiments royaux," and on Jan. 8, 1570, he succeeded Philbert Delorme as architect of the Tuileries palace. Nearly all his works have been destroyed.

BULL BAITING. A barbarous sport, once popular in England among all classes of society, but declared illegal in 1835. It consisted in causing a bull to be attacked by dogs, and to increase the fury of the bull his nose was sometimes blown full of pepper. Another form of the sport was to fasten the bull to a stake by a long rope and to set bulldogs at him, one at a time, which were trained to seize him by the nose, an act called *pinning the bull*. The spectators especially appreciated the success of the bull, when, lowering his head, he caught the dog on his horns and tossed him to a great distance. In some places bull baiting took place regularly as an annual event, and funds were sometimes left to provide for it. King James I delighted in this sport. When, as a prince, the Czar Nicholas I of Russia visited England in 1816, he attended a boxing match and a bull baiting, which were organized as samples of English sport.

An equally barbarous sport, termed *bull-running*, was formerly practiced at Stamford and Tutbury, where men and women maddened the

bull with hideous noise and then pursued and beat him with "bull clubs" till he expired.

BULLBAT (so called from the noise it makes and its flying mostly at dusk). A local name of the nighthawk (q.v.).

BULLDOG (for origin of name see below). A kind of dog which has existed as a distinct race in England for many centuries. It is regarded as a variety of the mastiff, or a cross between the mastiff and some other breed, and seems to have originated in a variety of great courage and tenacity developed in boar hunting. Short-eared mastiffs, called "alaunts" (*Alan* of heraldry), were so used in early English boar hunting; and modern bulldogs seem to have been developed out of them by the sport of baiting animals so prevalent from Norman times to the eighteenth century. The worrying of a bull in particular required a dog of ferocious courage, considerable weight, the instinctive habit of seizing the enemy by the nose, and indomitable strength and tenacity of jaw. These requirements were perfected by breeding, and the modern bulldog, which began to be recognized and cultivated early in the seventeenth century, is the result.

Modern standards call for a dog of the form shown in the Plate of Dogs, weighing about 50 pounds. He must have a compact, thickset, low-swung body, short and strong in the back, where the loins should be slightly elevated above the line of the withers upon muscular hind legs. The very wide shoulders and sturdy fore limbs characteristic of the breed must not be caricatured into uselessness, as is sometimes done; the dog must be able to walk any reasonable distance without exhaustion. The very large head, in circumference before the ears equal to the dog's height, must have an extremely short, heavily wrinkled face, forming at the throat a dewlap in two loose folds; the teeth should show, and the eyes be round and dark, and the ears be of the "rose" form—never erect. The small breeds, called "toy bulldogs," must conform to the model. Colors are various, but solid black undesirable. Red or some other pure brindle is at present preferred, and next to that solid white, red, fawn, or piebald.

These dogs were reared after the extinction of bull baiting mainly for fighting in dog pits, but latterly they have been largely bred and variously modified as watchdogs and as pets, and their dispositions have been found no less faithful and kindly than in the case of many other dogs gently treated.

The *French bulldog* is a small, compact breed of terror form and puglike face, having high, erect, batlike ears. It originated in Brussels, became fashionable as a pet in France, first appeared at American shows in 1896, and has rapidly become popular as an interesting little house dog of good disposition.

BULLE, bul'e, KONSTANTIN (1844-1905). A German historian. He was born at Minden, Westphalia, and studied philology, theology, and history at the universities of Jena and Bonn. He is the author of the following important works: *Geschichte der neuesten Zeit 1815-85* (1887); *Geschichte der Jahre 1771-77*, a continuation of Becker's *Weltgeschichte* (1878); "Geschichte des zweiten Kaiserreichs und des Königreichs Italien," in Oncken's *Allgemeine Geschichte* (1890).

BULLEN, bul'en, FRANK THOMAS (1857-1915). An English author and lecturer, born at Paddington, London. After meagre schooling

and a three years' experience as errand boy and gamin, he went to sea. He continued afloat until 1883 and rose from able-bodied seaman to chief mate. In 1883-99 he was junior clerk in the British meteorological office. His varied experiences on board ship throughout the globe afforded him material for what many critics have regarded as the most noteworthy contribution made by an Englishman to sea literature since the days of Marryat. Of his books the earliest, *The Cruise of the "Cachalot"* (1898), is the best known. Others are, *The Log of a Sea Waif* (1899); *Deep-Sea Plunderings* (1901); *Our Heritage the Sea* (1906); *The Call of the Deep* (1907); *Young Nemesis* (1909); *Fighting the Icebergs* (1910); *A Bounty Boy* (1912); *From Wheel and Outlook* (1913).

BULLER, bul'ér, SIR REDVERS HENRY (1839-1908). A British military officer. He fought through the Ashantee, Kaffir, and Zulu campaigns, winning the Victoria Cross in the last for the gallant rescue of three comrades. Later he served in the Boer War of 1881, in the Egyptian War of 1882, and in the Sudan Campaign of 1884-85. From 1887 to 1890 he was quartermaster general and in the latter year became adjutant general. He was promoted to be Meutnant general in 1891; in 1898 he was placed in command of the First Army Corps and the garrison of Aldershot, and in November, 1899, succeeded to the supreme command of the British forces in South Africa. Great things were expected of him there, for he had been regarded as one of the most active and indomitable fighting generals in the British army; but he suffered several serious reverses about Ladysmith and was then superseded by Lord Roberts and returned to Aldershot. In consequence of an ill-advised speech in London, soon after his return, he was retired. The unwise championship of friends also brought out facts regarding his South African leadership. The Secretary for War made public through the regular parliamentary channels the fact that General Buller, after his first reverse, had advised by heliograph message that General White, the defender of Ladysmith, abandon the siege and surrender his troops to the enemy, advice which the latter refused to adopt under any circumstances. The Secretary for War, in commenting on the incident, said that, had this been carried out, it would have been the "most calamitous reverse in English military history." With the publication of these official documents and statements was swept away Buller's reputation as a war commander. Consult Jerrold, *Sir Redvers H. Buller* (London, 1908).

BULLET (Fr. *boulette*, dim. of OF. *boule*, ball, from Lat. *bulia*, knob, boss). The projectile discharged from a rifle, pistol, machine gun, or similar weapon. For military purposes, in its spherical form, it is practically obsolete, its place being taken by various forms of elongated projectiles. The small-bore bullets of modern rifles have a pressed leaden or steel core, and a covering or thin envelope of steel, copper, or nickel, and are gradually becoming longer in length. The copper-coated bullet is generally condemned because of its poisonous character, a combination of nickel and copper, known as cupro-nickel, being most generally employed. Formerly bullets were placed in the firearm independent of the powder; both are now contained together in the cartridge. See AMMUNITION; CARTRIDGE; PROJECTILES; SMALL ARMS.

BULL FIGHT. A combat of men with bulls, for the entertainment of the public. They were common in Greece, particularly in Thessaly, and at one time in Rome under the emperors. They are still a favorite pastime in Spain and Mexico, and, in a modified and more merciful form, in Portugal. In Spain they have been abolished by various sovereigns, only to be reestablished, the mass of the Spanish population being passionately fond of the sport. The most magnificent bull fights were at one time instituted by the monarchs themselves; at present, both in the capital and in the larger towns of Spain, they are held either as private speculations or for the benefit of public institutions. In Madrid, during the bull-fighting season, there is at least one afternoon in every week devoted to the sport. The fights take place in a kind of open-air circus, called the *Plaza de Toros*, round which the seats rise one above another, with a tier of boxes over them. The *Plaza* is capable of containing from 10,000 to 12,000 people. The best Andalusian bulls are bred at Utrera, the best Castilian ones on the Jarama, near Aranjuez. The latter are the breed usually employed in Madrid. The bull fight has been described as a tragedy in three acts. The principal performers in the first are the *picadores* or horsemen; in the second, the *banderilleros*, or footmen, are the actors; the third act devolves on the *matador*, or swordsman. The *picadores*, dressed in picturesque Spanish costume, and armed with a lance, and mounted on blindfolded and more or less decrepit horses, take up their position in the middle of the circus, opposite the bull stalls. The *banderilleros*, gay with ribbons and bright-colored cloaks, distribute themselves in the space between the barriers. The *matador*, or chief combatant, is also on foot. He is, during the preliminary parade, handsomely dressed, but when he enters the ring for business he has doffed his expensive trappings and holds in the right hand a naked sword, in the left the *muleta*, a small stick, with a scarlet-colored silk attached. On a sign given by the chief magistrate, a bull is let out from the stalls; the *picadores* stand ready in the arena, lance in hand, awaiting his charge. With a brave bull, they find all their skill requisite in acting on the defensive; with a cowardly one, they act on the offensive, and should their stabs be ineffectual in rousing the animal to the requisite fury, the poor beast is hooted by the crowd and ultimately stabbed ingloriously in the spine. Whenever a horse is wounded, the rider betakes himself to flight; and when either the above casualty happens or a *picador* is thrown, the *banderilleros* rush in, and attract the bull by their cloaks, saving themselves, if need be, by leaping over the palisade which incloses the circus. When the bull begins to flag, the *picadores* are succeeded by the *banderilleros*, who bring with them the *banderillas*, i.e., barbed darts, about 2 feet long, ornamented with colored paper flags, which they stick into the neck of the animal. Sometimes these darts have firecrackers attached to them, the explosion of which makes the bull furious. The *matador* then enters alone to complete the tragic business. As soon as the bull's eye catches the scarlet-colored silk by means of which the *matador* lures the bull, he generally rushes blindly at it; and then the *matador*, if he is well skilled, dexterously plunges the sword "between the left shoulder and the blade," and the animals drops dead

at his feet. Sometimes the *matador* essays a bolder coup, and with his cape crossed over his breast awaits the onslaught, or he may leap over the charging bull and stab him with a *picador's* lance; or he deftly places two lances, one from each hand, between the shoulder-blades of the bull. The victorious *matador* is greeted with acclamations, and not less so the bull, should he wound or even kill the *matador*, in which case another *matador* steps forth into the arena; but human life is rarely sacrificed. Eight or 10 bulls are often dispatched in a single day, 20 minutes being about the time usually taken to slay one. About 1300 bulls and 6000 horses are sacrificed annually in Spain to this "sport." Consult Sancho, *Machaquito y el renacimiento del toreo* (Madrid, 1906).

BULLFINCH. A finch of the genus *Pyrrhula*, characterized by the short, thick, rounded bill, bulging at the sides, and hence suggesting the head of a bull; specifically the familiar European species (*Pyrrhula pyrrhula*, or *europæa*), cultivated as a cage bird. The bullfinch has very soft and dense plumage, delicate bluish gray above, the under parts bright tile red, the crown of the head and the beak jet black, which color also appears in the greater wing and tail coverts, in the quills, and in the tail feathers; the wings are crossed by a conspicuous white bar. The colors of the female are less bright than those of the male. It frequents woods and gardens, builds its nest in low trees or bushes, feeds chiefly on seeds and berries in winter, and in spring is excessively destructive to the buds of fruit trees in those localities in which it is abundant, as it selects the flower buds.

The song of this bird, in a wild state, is very simple and has no particular quality to recommend it; but it is remarkably susceptible of improvement by education, and trained "piping" bullfinches of superior acquirements are sold at a very considerable price. Some of these birds learn to whistle an air very accurately, and with a power and variety of intonation far exceeding their natural song. The ability to whistle as many as six airs well has been attained. The training of these birds is a work both of time and trouble; it is chiefly carried on in Germany, where regular "schools" exist for the purpose, and where various hybrid races are produced for the market. (See CAGE BIRDS.) The bullfinch is capable of very strong attachment to those who feed and caress it and often becomes so thoroughly domesticated as to exhibit no desire for liberty. It is replaced in eastern Europe and Asia by other species, and one which is native to central and southern Siberia (*Pyrrhula cassini*) has been observed in Alaska. See Plate of CAGE BIRDS.

BULLFROG. The largest of North American frogs (*Rana catesbeiana*), and the largest representative of a genus of aquatic frogs widely distributed over the Northern Hemisphere. They are solitary during most of the year, but gather together at the breeding season, when hundreds may be seen in a single small pond. Here the males give utterance to the bellowing croak which gives them their name and which can be heard half a mile. It is a hoarse, deep bass *brwoom*. It is common in eastern North America from Canada to Mexico. Its food consists of almost anything alive which it can seize and swallow—mollusks, crayfish, fishes, and even ducklings and small water mammals. On

the other hand, bullfrogs are devoured by snakes, fish, herons, alligators, and others. It reaches an extreme length of 7 or 8 inches and is green in various shades, brightest on the head, and blotched about the legs. The eggs are laid in strings, and the tadpoles require two or more years to gain maturity. The hind legs of this frog taste like delicate spring chicken and are often found in American markets, especially in the region of the Great Lakes, along whose borders these frogs are particularly large and abundant. (See Colored Plate of AMERICAN FROGS AND TOADS, accompanying the article TOAD.) Frogs of great size and power of voice are given the same name in some other parts of the world; thus the "bullfrog" of English-speaking people of Siam and Malay is *Callula pulchra*, which is excessively noisy during the rainy season.

BULLHEAD, or **BULLPOUT** (so called on account of the size of its head). Any of the several fishes of the families Siluridae and Cottidae; in the United States most commonly the small catfish or horned pout (*Amiurus nebulosus*) of the fresh waters of the North and East, which varies from yellowish brown to black and grows to a length of 18 inches. It has been acclimated in California and is important as a food fish in the Sacramento Basin, where it is known as "Sacramento cat" and is in great demand among the Chinese. "The horned pout," says Dr. Theodore Gill, "is a sluggish fish, fond of the mud, and growing best in weedy ponds and waters which have no current. They stay near the bottom and move slowly about, with their barbels widely spread, watching for anything eatable. They will take any kind of bait, from an angleworm to a piece of a tin tomato can. . . . They are very tenacious of life, and will live in any sort of pond or pool where frogs or salamanders can exist. . . . They spawn in the spring and the adult fishes lead the young in great schools near the shore, apparently caring for them as a hen cares for her chickens." For illustration, see CATFISH.

In Great Britain the name is given mainly to the ugly spinous fishes of the genus *Cottus*. They are mostly small and abundant in clear streams in northern Europe, Asia, and America. (See MILLER'S THUMB; SCULPIN.) The name "armed bullhead" is often given to one of the gurnards (q.v.), a marine fish of a related genus (*Agonus*).

BULLIER, by'lyá', BAL. A noted place of resort, especially for students, in the Latin Quarter of Paris, first called the Prado d'Été, and later named for the founder, Bullier.

BULLINGER, bul'ing-ér, HEINRICH (1504-75). A Swiss reformer. He was born at Bremgarten, in the Canton of Aargau, July 18, 1504. He was sent to the school of the Brothers of the Common Life at Emmerich when 12 years old and there sang on the streets for his support, as Luther did at Eisenach. In 1519 he went to Cologne to study at the famous university, and there he became acquainted with the writings of Luther, so that when he took his degree in 1520 he was already a Protestant. He taught at the school attached to the Cistercian Monastery at Cappel, near Zurich, from 1522 to 1529, and aided in the introduction of the Reformation into Cappel, which took place gradually in 1525-26. He made Zwingli's acquaintance in 1523 and participated in the disputation with the Anabaptists at Zurich in

1525, and in the religious conference held at Bern in January, 1528, the result of which was the reformation of that canton. In June, 1528, he became evangelical pastor at Cappel. In 1529 he married Anna Adlischwyler, formerly a nun, who bore him 11 children. In 1529 he succeeded his father as pastor at Bremgarten, and by a powerful sermon which he preached there he induced his whole congregation to burn the images in the church and pass reform laws. But after the defeat at Cappel, Oct. 11, 1531, where Zwingli was slain, his position became insecure, and on the night of November 20-21 he fled to Zurich, where, on December 9, he was appointed pastor of the principal church, in succession to Zwingli, and did a great work in building up a vigorous organization in the canton. He was, indeed, the second founder of the German Reformed church. He also exerted great influence upon the Church of England through the Marian exiles (1553-58) whom he sheltered and counseled. They displayed their gratitude in various ways, and in 1586 Convocation enjoined the reading of his sermons upon "inferior ministers." In the controversy on the eucharist and the affairs of the Anabaptists Bullinger distinguished himself by his integrity and moderation, and in his house in Zurich several German theologians, compelled to leave their country, found a haven of refuge. He shared in the first (1536) and was sole author of the second Helvetic confession (1566). He died in Zurich, Sept. 17, 1575. His writings are numerous, but uncollected and unprinted. The most important is a *History of the Reformation*, in Swiss-German (first edited and printed, 3 vols., Frauenfeld, 1838-40). Several of his treatises have appeared in German, and especially 50 of his sermons, divided into five decades, hence commonly known as Bullinger's *Decades* (London, 1577), reprinted by the Parker Society, Cambridge, England (1849-52). For his life, consult: Solomon Hess (Zurich, 1828-29); Carl Pestalozzi (Elberfeld, 1858); also R. Christoffel, *Heinrich Bullinger und seine Gattin* (Zurich, 1875); G. R. Zimmermann, *Die Züricher Kirche und ihre Antistes* (Zurich, 1877); Lindsay, *History of the Reformation*, vol. ii (New York, 1907).

BULLION, bul'yon (LL. *bullio*, mass of gold or silver, dimin. of Lat. *bullā*, boss, stamp, seal, or perhaps corrupted from Fr. *billon*, Sp. *vellon*, base coin, LL. *bullio*, bullion). This term is usually employed to designate uncoined gold or silver, which has been reduced to the standard fineness of the coinage of a country, but is sometimes used to designate the metals generally, whether coined or uncoined. The latter use is quite common in England, where the metallic reserve of the bank is reported as so much bullion. In the United States bullion is rarely applied to coin. Gold in bars answers some of the monetary purposes of coined gold when it is used as a reserve for note issues. The Act of March 3, 1863, which authorized the issue of gold certificates, provided that they could be issued against either gold coin or bullion deposited in the Treasury of the United States. In the same way the great national banks of Europe, which, like the United States Treasury, are storehouses from which gold can be drawn for exportation, hold a portion of this reserve in bars. For international shipments gold bars possess certain advantages over coin, and a large part of the gold shipped from the

United States is in this form. In the decade 1901-10 imports of gold, chiefly bullion, into the United States ranged from a minimum of \$43,339,905 in 1910 to a maximum of \$148,337,321 in 1908. The extremes of exports were \$38,573,591 in 1906 and \$118,563,215 in 1910.

BULLION STATE. Missouri. See STATES, POPULAR NAMES OF.

BULLOCK, bul'lok, ALEXANDER HAMILTON (1816-82). An American politician. He was born in Royalston, Mass.; graduated at Amherst College in 1836, studied at the Harvard Law School, was admitted to the bar in 1841, and practiced law in Worcester. He was a member of the Massachusetts House of Representatives from 1845 to 1847 and again from 1861 to 1865 and was its Speaker during the latter period. He was also a member of the State Senate in 1849. Besides holding several judicial offices, he was Mayor of Worcester in 1859, and Governor of Massachusetts in 1866-68. His public addresses include: *Massachusetts and the War Tax* (1862); *Abraham Lincoln* (1865); *The Mechanical Arts Favorable to Liberty and Social Progress* (1865). Consult Charles Denene, *Memoir of Alexander H. Bullock* (1887).

BULLOCK, CHARLES JESSE (1869-). An American economist. He was born in Boston, Mass., graduated at Boston University in 1889, and received the degree of Ph.D. from the University of Wisconsin in 1895. He taught economics at Cornell (1895-99), at Williams (1899-1902), and then at Harvard. His best writing is in the field of financial history and theory, especially the finances of the United States between 1775 and 1789 (*University of Wisconsin Bulletin*, 1895). Among his works are: *Essays on the Monetary History of the United States* (1900), *Introduction to the Study of Economics* (1900), *Finances of Massachusetts, 1789-1905* (1907), *Select Readings on Economics* (1907), and *On Public Finance* (1906), and an edition of William Douglass's *Discourse Concerning the Currencies of the British Plantations in North America* (1897).

BULLOCK, RUFUS BROWN (1834-1907). An American politician. He was born in Bethlehem, N. Y., but in early life went to Augusta, Ga., to organize the Southern Express Company. During the Civil War he served as acting assistant quartermaster general in the Confederate army, and in 1867 he was a delegate to the State Constitutional Convention. In 1868 he was elected Governor of Georgia. Soon afterward the negro members were expelled from both houses of the Legislature, and Governor Bullock appealed to Congress to restore them to their seats. The next legislative election, however, brought in such a large majority opposed to the reconstruction policy that he resigned his office. He subsequently became president of the Macon and Augusta Railroad, president of the Atlanta Cotton Mills and of the Atlanta Chamber of Commerce, and government director of the Union Pacific Railroad.

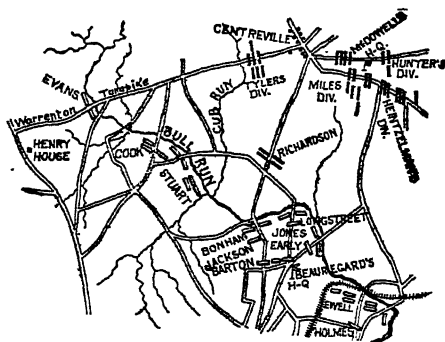
BULLOCK, SHAN F. (1865-). An English novelist, born at Crom, Fermanagh, Ireland. His publications include: *The Awkward Squads* (1893); *By Thrasna River* (1895); *Ring o' Rushes* (1896); *The Charmer* (1897); *The Barrys* (1899); *Irish Pastorals* (1901); *The Squireen* (1903); *The Red Leaguers* (1904); *Dan the Dollar* (1905); *The Cubs* (1906); *Robert Thorne* (1907); *A Laughing Matter* (1908); *Master John* (1909); *Hetty* (1911); *Thomas*

Andrews (1912); *The Race of Castlebar*, with Miss Lawless (1913).

BULLOCK, WILLIAM A. (1813-67). An American inventor. He was born at Greenville, N. Y., and early learned the trade of iron founder and machinist. About 1855 he went to New York City, where he constructed a fast press on the planetary system for an illustrated weekly. The remarkable success of this invention encouraged him to perfect a rotary printing press embodying in one machine automatic adjustment and feeding, "perfecting," as printing on both sides is called, at a high rate of speed, using a continuous roll of dampened paper. Thus was invented the web perfecting press, capable of turning out 30,000 newspapers, cut apart and folded, within an hour. While engaged in setting up a new press in Philadelphia, Mr. Bullock was accidentally caught in the main driving belt and sustained injuries which caused his death.

BULLOCK'S-HEART. See CUSTARD APPLE.
BULL OF THE CRUZADA. See CRUZADA, BULL OF THE.

BULL RUN, FIRST BATTLE OF. The first important battle of the Civil War. It was fought on Sunday, July 21, 1861, near a small stream of this name, in northeast Virginia, about 30 miles southwest of Washington, between a Federal army under General McDowell, and a Confederate army under Generals Beauregard and Johnston. On each side the troops were green, poorly drilled, and wholly inexperienced. The Federals, under Hunter, began the battle at 10 A.M. by a flank attack and, supported by the centre under Tyler, drove the

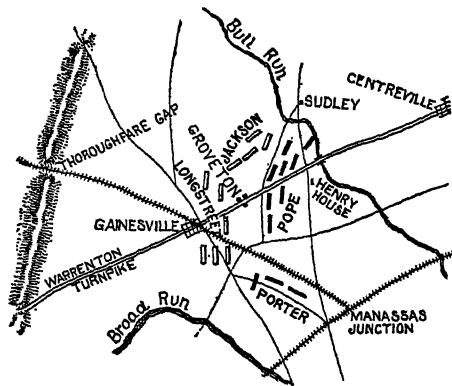


POSITION OF OPPOSING FORCES ON JULY 21, 1861.

Confederate right before it until stopped, while ascending a slope, by a brigade under T. J. Jackson, who here earned the sobriquet "Stonewall." After several stubborn attacks McDowell finally (about 3 P.M.) gained the disputed ground and held it for an hour; but a Confederate reinforcement under Kirby Smith having arrived, Johnston, who had been posted in the rear of the Confederate lines, suddenly attacked in force and drove the Federal troops in great confusion, first from their position and then from the field. The defeat became a rout and then a panic, and the troops fled in wild disorder, reaching Washington in a state of utter demoralization. The Confederates, disorganized almost as much by victory as the Federals were by defeat, made no attempt at pursuit. McDowell had at his disposal about 29,000 men, and Johnston about 28,000, though the number actually engaged was only about 18,000 on each side, of which the Federals lost, in killed, wounded, and

captured or missing, about 2800; the Confederates about 2000. The battle caused great consternation in the North and great enthusiasm in the South, while abroad, and especially among the upper classes in England, it was regarded as conclusive proof of the superior fighting capacity of the Confederate troops. It may be regarded as having, in effect, changed the status of the conflict from that of a rebellion to that of a civil war. By the Confederates the battle was generally called the "Battle of Manassas." Consult: *Official Records*, vol. ii (Washington, 1880); *Ropes, Story of the Civil War* (2 vols., New York, 1894-98); Johnson and Buel (eds.), *Battles and Leaders of the Civil War*, vol. iv (4 vols., New York, 1887); Nicolay and Hay, *Abraham Lincoln: A History* (10 vols., New York, 1890); Stevens, "The Second Battle of Bull Run," in *Military Historical Society of Massachusetts, Papers*, vol. ix. pp. 449-95 (Boston, 1912).

BULL RUN, SECOND BATTLE OF. An important battle of the Civil War, fought Aug. 29 and 30, 1862, between a Confederate army of about 50,000, under General Lee, and a Federal army of about 70,000, under General Pope. While Pope, at the head of the Army of Virginia and a large part of the Army of the Potomac, was facing Lee along the line of the Rappahannock, Jackson, by a forced march, attained his rear through Thoroughfare Gap, with a force of about 25,000, and destroyed (August 26) the Federal supplies and munitions of war at Manassas and Bristow stations. Pope then turned, and on August 28 faced Jackson near Bull Run, but delayed his attack for a day, and at 10 A.M. on the 29th, Lee and Longstreet, hav-



SECOND BATTLE OF BULL RUN.

ing passed through Thoroughfare Gap almost unopposed, effected a junction with Jackson. At 3 P.M. Hooker, under Pope's orders, made the first serious attack on Jackson, but was driven back with considerable loss. Subsequently Kearny and McDowell also attacked, with somewhat more success. Meanwhile Porter, on the Federal left, had held Longstreet in check, though Pope, who did not know of the Confederate reinforcement, had expected him to attack Jackson in flank and rear. At the close of the day each side claimed a victory. This first day's fighting is sometimes called the battle of Groveton, from the small village which formed the centre of Jackson's position. At noon on the 30th Pope ordered McDowell, Porter, and Heintzelman "forward in pursuit of the enemy." Their attack was repulsed with great loss, and

Longstreet, by a counter attack, gradually forced the Federal army off the field. Pope, crossing Bull Run, took up a position at Centreville during the night of the 30th, and on September 1st withdrew to the defenses about Washington, fighting the battle of Chantilly (q.v.) en route. The Federal loss, though never accurately determined, was about 14,500, while that of the Confederates was about 9500. The battle closed Pope's campaign by forcing his army back upon Washington, and enabled Lee to take the aggressive and invade Maryland. (See ANTIETAM, BATTLE OF.) By the Confederates it was called the Second Battle of Manassas. Consult: *Official Records*, vol. xii (Washington, 1885); *Ropes, Story of the Civil War* (2 vols., New York, 1894-98), and *The Army under Pope* (New York, 1881); Cox, *The Second Battle of Bull Run* (Cincinnati, 1882); and Johnson and Buel (eds.), *Battles and Leaders of the Civil War* (4 vols., New York, 1887).

BULLS AND BEARS. A common designation in the stock markets for two classes of operators, the "bulls" being those who seek to advance prices, and the "bears" those who endeavor to bring them down. The terms are said to be derived from the fact that a bull tosses up with his horns, while a bear tears down with his claws.

BULL SNAKE. See PINE SNAKE.

BULL TERRIER. A cross breed between the bulldog and some terrier. See TERRIER and Plate of Dogs.

BULL TROUT. 1. A salmon-like trout (*Salmo trutta*) of northern Europe. (See SALMON.) 2. The Dolly Varden trout. See TROUT.

BULNES, bōl'nās, MANUEL (1799-1866). A Chilean statesman, born in Concepción. At the age of 16 he was imprisoned as a revolutionist by the Spanish authorities, but was soon released, and in 1818 joined the army of San Martín (q.v.) under whom he served as colonel throughout the Chilean Revolution. After a continuous warfare of three years (1820-23), he accomplished the temporary conquest of the Araucanian Indians. He was appointed brigadier general in 1831; commanded the Chilean army sent in 1838 against Gen. Santa Cruz in Peru; and, after taking Lima and winning the battles of Huarez and Puente del Bunin, combined his forces with those of Gamarrá and defeated Santa Cruz at Pan de Azúcar (Jan. 19, 1839), thus putting an end to the confederation between Peru and Bolivia. In recognition of his services he was appointed lieutenant general and created marshal of Ancacho. Afterward he served for two successive terms (1841-45, 1846-50) as President of Chile, and by his firm and able administration greatly contributed to the prosperity of the country. Consult Juan B. Alberdi, *Biografía de general Bulnes* (Santiago, 1846).

BÜLOW, by'lo, BERNHARD, PRINCE VON (1849-). A German statesman, born at Klein-Flottbeck, Holstein. He studied in Lausanne, Leipzig, and Berlin, served in the Franco-Prussian War, and in 1874 entered the German Foreign Office. He became Secretary of Legation at Rome, St. Petersburg, and Vienna, was chargé d'affaires at Athens during the important period of the Russo-Turkish War of 1877-78, and was appointed a secretary at the Berlin Congress. After further diplomatic service in Paris and St. Petersburg he was sent as Minister to Rumania in 1888 and as Ambassador to Italy in

1893. In 1897 he was appointed Foreign Secretary, and in 1899 concluded with Spain the treaty by which Germany acquired possession of the Caroline, Pelew, and Ladrone islands, receiving as a reward for his services the rank of count. He became Chancellor of the German Empire and Prime Minister of Prussia in 1900. His diplomacy was shaped on the whole in accordance with the ideas of his Imperial master. In 1905 he set into motion a campaign against the ambitions of France in Morocco which led to the fall of the French foreign minister Delcassé (q.v.) and the meeting of the Algeiras conference in 1906. Three days after the resignation of Delcassé he was raised to the princely rank (June 9, 1905). He showed great tact in smoothing over the blunders of his Imperial master, in particular the famous interview of the German Emperor published in the London *Daily Telegraph* in 1908. He was equally skillful in controlling a majority in the Reichstag among the different factions until the failure of his budget proposals which led to his resignation in 1909. His *Imperial Germany* was published in 1914. Consult Martin, *Fürst Bülow und Kaiser Wilhelm II* (Leipzig, 1909).

BÜLOW, DIETRICH ADAM HEINRICH, BARON VON (1757-1807). A German military historian, born at Falkenberg, Prussia, educated at the military school in Berlin and in 1773 a Prussian officer and later in the service of the Netherlands. In 1792 he came to America, where two years afterward he lost his entire fortune. Upon his return to Berlin he wrote his principal work, *Der Geist des neuen Kriegssystems* (1798; 3d ed., 1835), which created a great sensation. Afterward he lived in London (where he was imprisoned for debt) and in Paris, whence he was banished in 1804. In consequence of his extremely satirical work entitled *Der Feldzug von 1805* (Leipzig, 1806), he was imprisoned at the request of the Russian government, first in Berlin, then in Kolberg, and finally in Riga, where he is said to have died in great misery. He was the first writer of importance to point out the advantages of the modern "extended order" of handling troops in battle. Consult Cammerer, *Development of Strategic Science* (London, 1905).

BÜLOW, FRIEDRICH WILHELM, BARON VON, COUNT VON DENNEWITZ (1755-1816). A Prussian general in the War of Liberation, brother of the preceding. He was born at Falkenberg, and entered the army in his fourteenth year. In 1813 Bülow who had reached the grade of lieutenant general, was the Prussian commander in the first successful encounter with the French at Möckern (April 5) and later at Halle. His victories over Oudinot at Grossbeeren and Ney at Dennewitz saved Berlin and inflicted severe loss on the enemy. Thereafter he returned to his governorship of Prussia, to which he had been appointed in 1812. He acted a conspicuous part in the battle of Leipzig, overran Holland and Belgium, winning the battle of Hoogstraaten, and by taking possession of Montmartre finished the campaign of 1814. The King acknowledged his services by the title of Count von Dennewitz. In the campaign of 1815 he joined Blücher by forced marches, and headed the column that first came to the aid of Wellington at Waterloo. He was made Knight of the Black Eagle, and after Waterloo a Prussian regiment received his name. He died in Königsberg,

Feb. 25, 1816. Consult Bülow, *Generalfeldmarschall Graf Bülow v. Dennewitz* (Vienna, 1910).

BÜLOW, HANS GUIDO VON (1830-94). A German pianist and conductor, born in Dresden, Jan. 8, 1830. He studied the pianoforte under Friedrich Wieck, and harmony and counterpoint under Eberwein and Hauptmann. In 1848 he entered the University of Leipzig to study law, but the next year went to Berlin, and after hearing a performance of *Lohengrin*, conducted by Liszt in Weimar in 1850, he resolved to make music his profession. He placed himself under Wagner in Zurich, but subsequently went to Weimar to study the pianoforte with Liszt. In 1853 and 1855 he made concert tours in Germany and Austria. In 1855-64 he was principal instructor of the pianoforte in Stern's Conservatory in Berlin, where he organized symphony and chamber concerts, and contributed musical articles to the press to advance the theories of Liszt and Wagner, and also edited the *Neue Zeitschrift für Musik*. In 1864 he became director of the conservatory and conductor of the royal opera in Munich, where he conducted the first performances of Wagner's *Tristan und Isolde* and *Die Meistersinger*. In 1869 the relations of his wife (Cosima Liszt, whom he had married in 1857) with Wagner compelled him to leave her. This personal wrong did not in any way affect his worship of Wagner the musician, although he never wanted to meet again Wagner the man. He settled in Florence, and until 1872 gave numerous concerts to spread German music in Italy. Afterward he went to London and in 1875-76 visited the United States. Subsequently he was conductor of various orchestras in Germany, and again visited America in 1889 and 1890. From 1880 to 1885 he was court conductor to the Duke of Meiningen. In a very short time he made the orchestra the most famous in all Germany and took it on extensive tours, creating a sensation everywhere. In 1882 he married the actress Marie Schanzer. From 1886 until his death he directed the famous *Abonnementskonzerte* in Hamburg. He died in Cairo, Feb. 12, 1894. Bülow was one of the greatest pianists of his century, and his fame as a conductor was equally great. His performances were characterized by the complete sinking of his own personality in the genius of whatever master he was interpreting and by attention to minutest details. His memory was extraordinary; he played and conducted everything without notes. He was, perhaps, the most erudite of musicians, and his scholarly attainments extended beyond his profession. Von Bülow was the greatest authority on Beethoven and published an edition of his pianoforte works. He also made pianoforte transcriptions from Wagner, Liszt, and Berlioz. His compositions include: Music to Shakespeare's *Julius Cæsar*, op. 10; *Des Sängers Fluch*, ballad for orchestra on Uhland's poem, op. 16; and *Nirvana*, a "symphonisches Stimmungsbild," for orchestra, op. 20. His *Letters* (3 vols., 1895-98) were published by his widow, Eng. trans. by C. Bache (1st vol., 1897). Consult: Pfeiffer, *Studien bei Hans von Bülow* (Berlin, 1894); H. Reimann, *Bülow* (Berlin, 1906); La Mara, *Hans von Bülow* (Leipzig, 1911).

BÜLOW, KARL EDUARD VON (1803-53). A German author. He was born at Berg vor Eilenburg and studied the classics at the University of Leipzig. He was a friend and imita-

tor of Ludwig Tieck. His literary fame rests chiefly upon his *Novellenbuch* (4 vols., 1834-36), which contains 100 tales based on older specimens in Italian, Spanish, French, German, English, and Latin. This was followed by *Das neue Novellenbuch* (1841) and by a collection of original *Novellen* (1844-48) of a like character.

BÜLOW, MARGARETE VON (1860-85). A German novelist. She was born in Berlin and spent her early years partly in Thuringia and partly in Smyrna, where her father was Prussian consul. She was drowned in the Rummelsburger Lake, near Berlin, while endeavoring to save the life of a boy. Her fiction, much of which attained a rapid popularity, includes the following: *Novellen*, a collection of stories (1885); *Neue Novellen* (1890); *Jonas Briccicus* (1886); *Herr im Hause* (1886); *Aus der Chronik derer von Riffelshausen* (1887).

BULOZ, bu'lô', FRANÇOIS (1803-77). A French editor. He was born at Vubens, in Haute Savoie, settled in Paris, and became a proof reader and translator. In 1831 he took charge of the *Revue des Deux Mondes*, which had been established two years before. This bimonthly, probably the most celebrated review in the world, he edited with conspicuous ability until his death. He also conducted the *Revue de Paris* from 1835 to 1845. During the years 1838-48 he was director of the Comédie Française.

BULRUSH. A name applied to many species of the genus *Scirpus* (sedge family), growing in marshes. Other species of the genus are called club-rushes. The common European bulrush is *Scirpus lacustris*, and its American representative is *Scirpus validus* (formerly thought to be *S. lacustris*). These two bulrushes grow about the muddy margins of lakes and ponds, with a creeping root and round stems varying from 2 to 10 feet in height, which are almost leafless, and bear their flowers in compound umbels of small brown spikelets. The root is astringent and diuretic and was formerly employed in medicine; but the stems are the most useful part of the plant, being much employed for making chair bottoms, mats, etc.; also by coopers for filling up spaces between the seams of casks, to which purpose their spongy nature particularly adapts them, and not unfrequently for thatching cottages. A variety, common in California, is much used as covers for wine bottles in packing. See AQUATIC PLANTS.

BULTHAUPT, bult'haupt, HEINRICH (1849-1905). A German poet, dramatic author, and lawyer, city librarian of his native town, Bremen. In both the lyrical and the dramatic genres, Bultaupt gives evidence of exceptional talent and versatility, and many of his works have achieved considerable popularity. His dramatic productions include *Saul* (1870); *Ein corsisches Trauerspiel* (1871); *Die Arbeiter* (1876), in which work a distinctively modern subject is treated with admirable skill; *Gerold Wendel* (1884; 2d ed., 1890); *Die Kopisten*, comedy (1875); *Lebende Bilder*, comedy (1875); *Ahasver* (1904). He furnished the text to oratorios composed by Bruch and Vierling, prepared adaptations of Shakespearean dramas (*Cymbeline*, 1885, and *Timon von Athen*, 1894); and wrote a number of poetic works (*Durch Frost und Gluten*, 1892; new ed., 1904), and criticisms, notably *Shakespeare und der Naturalismus*, as well as some novelettes. The work by which he

achieved especial distinction, however, is the *Dramaturgie der Klassiker* (1882 et seq., and frequently reprinted as *Dramaturgie des Schauspielers*)—a splendid exposition of the dramatic art of Shakespeare and of the German classicists and their successors. This was followed by his *Dramaturgie der Oper* (2 vols., 1887). Consult H. Kraeger, *Litterarische Vorträge aus dem Nachlass ausgewählt und durchgesehen* (Oldenburg, 1912).

BULUWAYO, boo'loo-wä'yô, or BULA-WAYO. The capital of Matabeleland, in the British colony of southern Rhodesia, South Africa, about 250 miles southwest of Salisbury (Map: Africa, G 7). It has a number of mercantile houses, banks, schools, churches, and newspapers. It is connected by rail with the British possessions in South Africa. The temperature is very uniform, the average for the summer being 75° and winter 64°. The white population of the district was 5995 in 1904; in 1911, 10,859.

BULWARK (Dan. *bulværk*, from *bul*, trunk of a tree + *værk*, Ger. *Werk*, Eng. *work*). In military matters, the old name for a rampart or like defense. In a ship, the bulwarks are the parts of a ship's side which project above the level of the upper deck. In ordinary vessels they form a parapet, protecting the seamen from the waves and preventing loose articles from being swept off the deck; in men-of-war of certain types—such as gunboats and small cruisers—they, in addition, serve to protect the men from an enemy's small-arm fire.

BULWER, bul'wër, WILLIAM HENRY LYTTON EARLE, BARON DALLING AND BULWER (1801-72). An English diplomat and author, familiarly known for years as Sir Henry Bulwer. He was born in London, Feb. 13, 1801, a descendant of illustrious families on both sides, and was educated at Sunbury, Harrow, and Cambridge. In 1822 he published his first literary work, remarkable for its prophetic dedication to his younger brother, Edward Lytton Bulwer. In 1824, as agent for the London Greek Committee, with a large amount of money consigned to Prince Mavrocordato, he made an adventurous journey to the Morea, which he described in *An Autumn in Greece* (1826). He entered the army, but abandoned it for the diplomatic service, and from 1827 was attached successively to the British embassy at Berlin, Brussels, and The Hague, acquiring a brilliant reputation. In 1830 he entered Parliament as an advanced Liberal, and in 1837 became Secretary of Embassy at Constantinople, where he negotiated and concluded a treaty which is the foundation of Great Britain's commercial system in the East. In 1843 he was made Minister Plenipotentiary to the Court of Madrid, and concluded the peace between Spain and Morocco in the following year. While in Spain his firmness and candor proved inconvenient to Narvaez, the Spanish soldier dictator, who, accusing him of plotting against the Spanish government, ordered him to leave Madrid, May 19, 1848. Parliament approved of Bulwer's conduct, and he was awarded the highest decoration of the Order of the Bath. In 1849-52 he was Minister to Washington, where he negotiated the Clayton-Bulwer Treaty in 1850. (See CLAYTON, JOHN MIDDLETON.) In 1852 he went to Tuscany as Envoy Extraordinary, and in 1856 was nominated commissioner at Bucharest for investigating the state of the Danubian principalities.

He was appointed Ambassador to the Porte in 1858 and held the position until 1865. In 1871 he was created Lord Dalling and Bulwer. He died in Naples May 23, 1872. His works include: *France, Social, Literary, and Political* (London, 1835-36); a *Life of Byron* (1835); *Historical Characters* (1868-70); and an unfinished *Life of Palmerston* (1870-74).

BULWER-LYTTON, EDWARD GEORGE EARLE, first LORD LYTTON (1803-73). An English novelist, born in London, May 25, 1803. He was the youngest son of William Earle Bulwer, of Heydon Hall, Norfolk, and Elizabeth Barbara Lytton, of Knebworth, Hertfordshire. His father died in 1807; and on the death of his mother in 1843, Bulwer assumed her surname. After attending various schools he proceeded to Cambridge, and graduated B.A. from Trinity Hall in 1826. At the university he read extensively in history, won the chancellor's medal for a poem, and was regarded as one of the best speakers in the Union Society. Parts of 1825 and 1826 he passed in Paris, where he was admitted into the "most brilliant houses of the old noblesse." He returned to England, a typical dandy of the period, and married (1827) a clever Irish girl named Rosina Doyle Wheeler. As the marriage caused an estrangement between mother and son, Bulwer was thrown largely on his own resources for a living. He wrote extensively for the magazines and the annuals and produced novel after novel. The marriage proved most unhappy, and a legal separation was granted June 14, 1836. On the death of his mother he succeeded to the Knebworth estate. Bulwer sat in Parliament during two long periods, first as a Protectionist Liberal and then as a Conservative (1831-41 and 1852-66). In 1858 he was appointed Secretary of State for the Colonies, and in 1866 was raised to the peerage as Baron Lytton. Though not a ready debater, he succeeded well with prepared speeches. He died in Torquay, Jan. 18, 1873, and was buried in Westminster Abbey. Bulwer was a versatile writer. He composed verse at the age of seven and published a volume when a schoolboy (1820). Other volumes followed in 1823, 1825, and 1827. At this time Bulwer was passing through several phases of Byronic influence. Among his later poems are *The New Timon* (1846), *King Arthur* (1848), and *St. Stephens* (1860). The first has become memorable for a fierce assault on Tennyson and for Tennyson's reply in *Punch*. Of the various metres Bulwer essayed, he succeeded best in the heroic couplet. He wrote several plays, which, though mediocre as literature, have long kept the stage; among them are *The Lady of Lyons* (1838), *Richelieu* (1838), and *Money* (1840). Attempting the work of Gibbon, he wrote *Athens: Its Rise and Fall* (1837), but it was never completed. As a novelist he played many parts, adapting himself to public taste. He began with *Falkland* (1827), an interesting imitation of the *Sorrows of Werther*. His success as a novelist was assured by *Pelham* (1828), deemed by many critics the most delightful of all his books. He had now passed beyond the influence of Byron and German sentimentalism and presented the public with a new type of gentleman, the cynic in black waistcoat moving in high society. *Pelham* became in a way the type of the novel of contemporary manners to which Bulwer reverted at intervals: as in *Ernest Maltravers* (1837); *Alice* (1838); *Night and Morning* (1841); *The*

Castons (1850); *My Norel* (1853); and *Kenelm Chillingly* (1873). The last three have the added aim of humor in the manner of Sterne. Taking up the criminal novel as left by William Godwin (q.v.), Bulwer published *Paul Clifford* (1830) and *Eugene Aram* (1832). An experiment with the historical novel in *Devereux* (1829) led to the widely popular story, *The Last Days of Pompeii* (1834); *Rienzi* (1835); *Leila, or the Siege of Granada* (1838); *The Last of the Barons* (1843), by far his most solid achievement in historical fiction; *Harold* (1848); and *Pausanias the Spartan* (1876). Romance was essayed in *The Pilgrims of the Rhine* (1834); *Zanoni* (1842); *The Haunted and the Haunters* (1859), a remarkable story of the supernatural; of which the author wrote several versions, one of them being known as *The House and the Brain*; and *A Strange Story* (1862) expanded from *The Haunted and the Haunters*; and *The Coming Race* (1871). With the critics Bulwer has never found much favor. His work possesses none of the art of the great craftsmen, and it is affected in sentiment and style. But in spite of these faults, which were often pointed out by his reviewers, Bulwer gained the attention of the public at large and still holds it. *The Castons* and *The Coming Race*, though published anonymously to test the public, were as well received as any of the other novels. Bulwer's continued popularity rests upon the fact that he had something to say that is still of interest. His manner is wisely overlooked. Consult: *Life, Letters, and Literary Remains of Edward Bulwer*, by his son, the Earl of Lytton (London, 1883), containing the fragment of a poetic autobiography; and the biographies by Cooper (London, 1873); Ten Brink (Leyden, 1882); Escott, *Edward Lytton* (London, 1910); and Second Earl of Lytton, *Life of Edward Bulwer, First Lord Lytton* (2 vols., New York and London, 1913).

BULWER-LYTTON, EDWARD ROBERT ("OWEN MEREDITH"). See LYTTON, EDWARD ROBERT BULWER.

BUMBLE. A fat, pompous beadle in Dickens's *Oliver Twist*. After terrorizing the starved denizens of the workhouse for many years, he "sells himself" to the matron of that place, Mrs. Cornish, for "six teaspoons, a pair of sugar-tongs, and a milk pot; with a small quantity of second-hand furniture and 20 pounds in money," and is terrorized by her. From his character, the word "Bumbledom" sprang into common use, being especially taken up in *Punch*, in the caricatures by Leech and Tenniel.

BUMBLEBEE, or **HUMBLEBEE**. One of the social bees of the genus *Bombus*. It has a thick and very hairy body, the hairs often arranged in colored bands, and differs from the honey-bees in having the tibiae of the hinder legs terminated by two spines. The species are numerous and are found in almost all parts of the world, from the equator to the utmost polar limits of vegetation, but they seem to abound most of all in temperate climates. None is to be found in Australia and New Zealand, so that it was necessary to acclimatize these bees in those countries before clover could be successfully grown there, since that plant depends upon this kind of bee for fertilization. Consult *Insect Life*, vol. iv (Washington, 1891). (See POLLINATION.) The form of the name "humble-bee," commonly heard in Great Britain, is a modification of *hummel*, or *hummer bee*, and,

like our "bumblebee," refers to the loud droning sound produced partly by the wings, but mainly within the tracheæ of these insects.

Bumblebees do not form communities so large as those of honeybees, seldom more than 200 or 300 occupying one nest, and in some species not more than 50 or 60. The females are much less prolific than those of honeybees. The community is dissolved on the approach of winter, since males and workers die, and only females remain in a torpid state—among moss, in rotten wood, or in some other situation where they may enjoy protection from frost and concealment from enemies—to perpetuate the race by founding new communities in the ensuing spring. A fertile female selects for a nest a hollow log or cavity among stones, or some deserted mouse-nest or other hole in sod. Then she procures a mass of pollen and honey and in the mixture deposits a few eggs. The first brood consists entirely of workers. When some workers are matured, the fertile female abandons the collection of pollen and confines herself to the duties of egg laying. The workers collect the food, assist the young out of their cocoons, and enlarge the nest to meet the needs of the increasing numbers of the colony. The workers build rude waxen cells, but without the orderly arrangement of those of the honeybee. (For picture of nests and eggs, see Plate of WILD BEES.) Workers are chiefly produced in the earlier part of the season, males and perfect females in the latter part of it. The females are larger than the males and workers. Bumblebees differ from honeybees in that their females exist together in the same community without seeking to destroy one another. There is among them nothing analogous to swarming. Their combs do not exhibit the beautiful regularity of structure which characterizes those of the honeybees; but cells of a comparatively coarse appearance are clustered together, with silken cocoons of pupæ, balls of the kind already noticed, and open cells or pots filled with honey. These are preyed upon by mice and many large animals, which devour the brood as well as the honey. See BEE and Plate of WILD BEES; also Colored Plate of INSECTS.

BUMBLEFOOT (from *bumble*, a bungle, botch, referring to the misshapen foot). The name applied to a peculiar corn or abscess on the bottom of the foot of fowls. Some breeds are believed to be more susceptible to the trouble than are others. The disease is considered to be due to sitting on narrow perches or to walking on sharp gravel or on cement. Some cases are incurable, but the daily application of lunar caustic usually gives good results. Where pus is formed the abscess may be lanced or cut out.

BUMBOAT (perhaps Dutch *bumboot*, from *bun*, chest + *boot*, boat). A boat carrying provisions and other articles to ships lying in the stream, i.e., at anchor, and not alongside a wharf. In the case of men-of-war bumboats are commonly allowed even when the ship is at a wharf, as very few of the crew can go on shore except on certain days. In the United States navy the bumboat is inspected by the master-at-arms as soon as alongside, in order to see that no unauthorized articles are on board, and by the surgeon if the climatic conditions are such as to render special attention to diet necessary. Only persons of good reputation are allowed to traffic with the men, and these only after obtaining the consent of the executive offi-

cer. The bumboats ordinarily have for sale pastry, milk, fruit, confectionery, tobacco, cigars, cigarettes, stationery, sewing materials, handkerchiefs, towels, soap, etc. Nearly all large vessels of the navy have a commissary's store, frequently called the canteen, in which the same class of supplies are to be had as in the bumboat, but of greater variety and at much lower prices. The commissary's store has rendered the bumboat of much less importance to the men.

BUMMALOTI (E. Ind.). A marine fish (*Harpodon nehereus*) of the family Synodontidae, which is rather closely related to the Salmonidae. It is a native of the coasts of India, particularly of the Bombay and Malabar coasts, from which it is exported in large quantities, salted and dried, to other parts of India and other places. It is highly esteemed for its rich flavor and often used as a relish. In commerce, it is known not only as bummaloti, but also by the singular name "Bombay duck." It is a fish of elongated form, with large fins and a very large mouth, the gape of which extends far behind the eyes, and which is furnished with a great number of long, slender teeth. It is very voracious.

BUMPER, SIR HARRY. One of Charles Surface's dissolute friends in Sheridan's *School for Scandal*. He appears in Act iii, Scene 3, and sings there the jovial drinking song, "Here's to the Maiden of Bashful Fifteen," etc.

BUMPING POSTS. Devices erected at the ends of railway tracks in yards and stations to prevent cars from running off the track onto the ground or across the platform. A pile of crossties, or a bank of earth or cinders are sometimes used as bumping posts, and sometimes the ends of the rails are turned up and have a strong timber bolted to them extending across the track. A common construction of bumping post is a strong timber frame carrying dead-woods or buffers at the proper height to receive the blows of the car coupler or platform. Sometimes the buffer consists of a hydraulic cylinder carrying a piston with a piston rod provided at its outer end with a heavy disk against which the car strikes. The purpose of the hydraulic buffer is to reduce the shock of the striking car. Spiral spring buffers are used for the same purpose. Portable bumping posts of metal are made, which are attached to the rails wherever desired. These portable bumping posts are commonly called "stop blocks." A great variety of special and patented forms of bumping posts are made and used. Concrete bumping posts are now in common use.

BUMPTO, NATTY. See LEATHERSTOCKING.

BUMPUS, HERMON CAREY (1862-). An American educator, born in Buckfield, Me. He graduated in 1884 at Brown University and from 1886 to 1889 was professor of biology in Olivet College. In 1890 and 1891 he was assistant professor of zoology in Clark University, from 1891 to 1892 associate professor of zoology at Brown, and in 1892-1901 was professor of comparative anatomy there. He also became, in 1898, director of the biological laboratory of the United States Fish Commission at Woods Hole, Mass., and was assistant to the president and curator of the department of invertebrates in the American Museum of Natural History in New York in 1901-02, when he became director of the museum. He was chosen business manager of the University of Wisconsin in 1911. He published *A Laboratory Course in Invertebrate Zoology* (1893).

BUNAS. See **BANAS**.

BÜNAU, bü'nou, HEINRICH, COUNT (1697-1762). A German statesman and historian, born in Weissenfels. He studied law at the University of Leipzig, successively occupied several of the highest judiciary offices in Saxony, and later entered the service of the Emperor Charles VII. He was a patron of scientists and one of the ablest historians of his day. The following are some of his principal publications: *Deutsche Kaiser- und Reichshistorie* (4 vols., 1728-43), an admirable work, but uncompleted; *Historie des Krieges zwischen Frankreich, England und Deutschland* (1763-67).

BUNCE, FRANCIS MARVIN (1836-1901). An American naval officer. He was born in Hartford, Conn., and graduated at the United States Naval Academy in 1857. At the beginning of the Civil War he was executive officer on the *Penobscot*, which was engaged in the blockade off Wilmington, N. C. (1862), and he afterward commanded the expedition which resulted in the capture of Morris Island, S. C. (July 10, 1863). He served on the monitor *Patapsco* at the siege of Charleston, where, in November, 1863, he was wounded. In 1865 he took the monitor *Monadnock* from Philadelphia to San Francisco upon the first extended sea voyage ever made by a monitor. He became a lieutenant commander in 1863, a commander in 1871, a captain in 1883, and a commodore in 1895. He was commander of the naval training station at Newport, R. I., from 1891 to 1894, and was commandant of the North Atlantic station from 1895 to 1897 and of the New York navy yard from 1897 to 1899. On Dec. 25, 1898, he retired with the rank of rear admiral.

BUNCE, OLIVER BELL (1828-90). An American author. He was born in New York, where for several years he edited *Appleton's Journal*. He was the originator and editor of *Picturesque America*; wrote several novels including *Romance of the Revolution* (1852); *Bachelor Bluff* (1882), a collection of social essays; *The Adventures of Timias Terrystone* (1885); and a small book on manners, entitled *Don't* (1884), which passed through many editions and was translated into several foreign languages.

BUNCE, WILLIAM GEDNEY (1840-1916). An American painter, born at Hartford, Conn. He studied in New York at the Cooper Union Art School and under William Hart and at different art centres in Europe, particularly with Achenbach in Dusseldorf and in Antwerp with P. J. Clays, by whom he was principally influenced. Much of his time was spent in Venice, and his paintings are constant repetitions of such themes as "Venetian Sails" and "Fishing Boats," painted with only a basis of fact. His pictures are of fine decorative effect, with beautifully modulated color. He made Hartford his residence, but maintained a studio in New York. In 1907 he was elected a member of the National Academy of Design, and was chosen also to the National Institute of Arts and Letters.

BUNCH, MOTHER. The imaginary author of certain jest books and fairy tales which appeared in 1604 and 1760. The name is also derisively given to an alewife, by Tuca, one of the characters in Dekker's *Satiromastix*.

BUNCHBERRY. See **DOGWOOD**.

BUNCO, bū'kō (of doubtful origin; commonly derived from It., Sp. *banco*, bank). A term borrowed from the *argot* of the police, to

describe a method of swindling much practiced in large cities. The sharper learns the name and residence of a wealthy stranger, accosts him in the street, pretends to be a relative of some prominent citizen of the stranger's town, and, after securing his confidence, manages to rob him in any one of several customary ways, either by inducing him to cash a check, to bet, to lend money, or to buy alleged counterfeit money.

BUNCOMBE, bū'kūm, or **BUNKUM** (from *Buncombe County*, N. C.). A term originating in the United States, but now adopted in England as well, to signify an oratorical display not accompanied by conviction, but made merely to catch popular applause; also used loosely for any unreal professions. The word is said to be derived from the name of Buncombe Co., N. C., whose representative in the Sixteenth Congress (1819-21) made a very lengthy oration upon the Missouri question and informed the impatient members that he was "speaking for Buncombe."

BUNDABERG. A municipality and seaport of Queensland, Australia, 217 miles northwest of Brisbane (Map: Queensland, H 8), on the Burnett River 10 miles from its mouth. It is the port terminus of the Mount Perry-Bundaberg Railway. Its bridge over the Burnett cost £75,000. Exports are sugar, golden sirup, and sawn timber. Bundaberg is the port of the Eidsvold, the Mount Perry, and the Glassford Creek mines. Pop., 1911, 10,132.

BUNDELKHAND, bū'n'dāl-kūnd' (Skt. *Bandela Khanda*, land of the Bandelas). A revenue division of Central India which embraces a territory comprising several large and petty native states lying between the British district of Jhansi on the west and Baghelkand on the east (Map: India, C 3). It includes the Banda, Jalaun, Jhansi, and Hamirpur districts. Area of agency, 9851 square miles. Pop., 1901, 1,308,326; 1911, 1,375,317. The principal rivers are the Sindh, Betwa, Baighin, and Tons. The district is noted for its rich diamond fields and iron ore. The chief towns are Panna, Kalingar, Chhatarpur, and Bijawar.

BUNDI, būn'dē. A town of India, in lat. 25° 26' N. and long. 75° 43' E., 190 miles southwest of Agra, the capital of a small Rajput state of the same name (Map: India, C 3). It is situated in a valley nearly surrounded by rocky hills and commands the chief hill pass. It has over 400 temples and shrines. The State of Bundi has an area of 2220 square miles. The rajah and dominant portion of the inhabitants are Rajputs; in the mountains are the Minas, supposed to be an aboriginal race. Pop., 1901, 171,227; 1911, 218,731.

BUNGALOW, bū'gā-lō (Hind. *bangla*, adj. of *Banga*, Bengal). An Anglo-Indian term meaning in India a species of rural villa or one-storied house of light construction, usually of unbaked bricks with a thatched roof. Bungalows which are the residences of Europeans are of all sizes and styles, according to the taste and wealth of the owner. Some are of two stories, but usually they consist of only a ground floor with a central hall, and are invariably surrounded with a veranda, the roof of which affords a shelter from the sun. In the chief cities of India some of the bungalows are really palatial residences, while in the country they are of more moderate pretensions. In general, they are provided with exterior offices,

to accommodate the large retinue of domestics common in Indian life. Besides these private bungalows, there are military bungalows on a large scale for accommodating soldiers in cantonments; likewise public bungalows, maintained by the government for the accommodation of travelers, in which seem to be blended the characters of an English roadside inn and an Eastern caravanserai. These bungalows are quadrangular in shape, one story high, with high-peaked roofs, thatched or tiled, projecting so as to form porticoes and verandas. The bungalow is divided into "suites" of two, three, or four rooms, provided with bedsteads, tables, and chairs; windows of glass, and framed glass doors. Off each room is a bathroom, with earthen jars of cool water. Travelers are expected to bring their servants, cooking apparatus, wine, beer, bedding, etc., with them; but the khitmutgar of the better class of bungalows supplies tableware, condiments, and even sometimes food and liquors, and he is usually skilled in cooking. The government lays a charge of one rupee a day on each traveler for the use of the bungalow. At every travelers' bungalow is stationed a government peon, who acts as watchman and is bound to assist travelers' servants in procuring supplies of fuel and food in the nearest village. The distance between the bungalows on a trunk road is generally about 12 or 15 miles—an Indian day's journey. The introduction of railways is putting an end to this slow and annoying system of traveling in India.

In the United States the term has lately come into general use to designate any small house or cottage, whether for summer use only or for permanent occupation, in which all or most of the rooms are on the ground floor, and a broad and simple roof of low pitch covers the whole. The encircling veranda deemed essential in India is not an indispensable feature in these cottages, although one or more covered "piazzas" generally form a part of the design. When there are rooms on a second floor, this story is usually contained in the roof and lighted by dormers. This type of cottage has been developed with especial success in California. Consult Saylor, *Bungalows; their Design, Construction, and Furnishing* (New York, 1913).

BUNGAY, būn'gā, FRIAR. A conjurer famous in the reign of Edward IV. He is described in contemporary works as "a great scholar and a magician (but not to be compared with Fryer Bacon)." He was a great friend of the latter philosopher and is reputed to have aided him in making the fabulous "Brazen Head," which spoke only the words "Time is! Time was! Time is past!" and then broke in pieces. Another story has it that Bungay and the great German necromancer Vandermaast contested together for supremacy and were snatched away to other realms by the devil. Robert Greene wrote a play called after him, in 1594, and in *The Last of the Barons* Bulwer introduces him as a union of necromancer, "Merry Andrew," and friar. Bungay wrote several works in Latin.

BUNGE, būng'e, ALEXANDER VON (1803-90). A Russian traveler and botanist. He was born in Kiev and was educated at the University of Dorpat. His extensive and important travels through Asia (1826-29) with Ledebour are recorded in the work entitled *Karl Friedrich von Ledebours Reise durch das Altaigebirge und die dasungische Kirgisensteppes* (1829). In 1830 he accompanied a missionary expedition to

China as naturalist, and later published the results of his botanical investigation on the steppe of Gobi and in the environs of Peking in the works entitled *Enumeratio Plantarum quas in China Boreali Collegit* (1831) and *Plantarum Mongholicæ Chinesisum Decus I* (1835). He was appointed professor of botany and director of the botanical garden at Dorpat in 1836. His writings also include: *Beiträge zur Kenntnis der Flora Russlands und der Steppen Zentralasiens* (1851); *Anabasearum revisio* (1862); *Labiatae persicæ* (1873).

BUNGE, FRIEDRICH GEORG VON (1802-97). A German legal historian, born in Kiev, and educated at the University of Dorpat, where in 1831 he was appointed professor of law. Bunge was the editor of several periodicals, and published a large number of works on the laws of Livonia, Esthonia, and Courland, on which subject he was probably the greatest authority of his day. His principal writings include: *Forschungen auf dem Gebiete der Liv-, Esth- und Kurländischen Rechtsgeschichte* (1838); *Das Liv- und Esthländische Privatrecht* (2 parts, 1838-39; 2d ed., 1847-48); *Altivlands Rechtsbücher* (1879).

BUNGE, NIKOLAI KHRISTIANOVITCH (1823-95). A Russian political economist. He was born in Moscow and was educated at the university in that city. In 1881 he was appointed assistant to the Minister of Finance, Abaza, and in 1882 he succeeded him. The condition of the Russian finances at this time was extremely unfavorable. The war debt of 1877 had not been paid, the deficit in the national exchequer had steadily increased, and the paper currency had diminished in value. Nevertheless Bunge succeeded in establishing important reforms. He increased the national property by abrogating the poll tax and the tax on salt, by establishing agrarian banks in order to facilitate the acquisition of land by the peasantry, and by enacting various other measures tending to improve the condition of the rural population. His works, which are written in Russian, are devoted principally to a discussion of current economic questions.

BUNGERT, būng'ert, AUGUST (1846-1915). A German musician, born in Mülheim, Rhenish Prussia. His masters were Kufferath, Mathias, and Kiel, and he also studied in the Cologne and Paris conservatories. By many German musicians he has been regarded as one of the greatest composers of the Wagnerian school, but his trilogy based on the Homeric poems, and written directly on Wagnerian lines, seems not to have reached the spirit and significance of the model. His songs, however, are among the modern masterpieces of that kind of music. The two great opera cycles he has worked on include *Die Ilias*, comprising *Achilles* and *Klytemnestra*, and *Die Odyssee*, including *Kirke* (1898), *Nausikaa* (1901), *Odysseus' Heimkehr* (1896), and *Odysseus' Tod* (1903). There is an overture for each of these divisions; the entire work is entitled *Homerische Welt*. His other compositions include the comic opera *Die Studenten von Salamanca* (1884); a symphonic poem, *Auf der Wartburg*; *Hohes Lied der Liebe*; a mystery, *Warum? Woher? Wohin?*; *Heroische Symphonie*; incidental music to Goethe's *Faust*; *Meerlieder*; and *Lieder einer Königin*.

BUNIAS. A genus of plants of the family Cruciferae. The few known species are mainly natives of southeastern Europe and the Levant,

but several are reported indigenous to France. *Bunias orientalis*, introduced into western Europe, is grown as a forage crop and in some regions has escaped from cultivation. In Russia it is also used as a vegetable. Although a hardy plant, its cultivation is not general. The amount of herbage is small and, on account of its hairy covering, is not readily eaten by cattle. It is sometimes called hill mustard.

BUNION, būn'yon (It. *bugnone*, knob, OF. *bugne*, swelling, from Icel. *bunga*, elevation). A term applied in surgery to an enlarged bursa, or synovial sac, situated over the metatarsal joint of the great toe (see FOOT), and accompanied by more or less distortion of the joint. In the great majority of cases bunions are directly produced by the pressure of badly fitting boots, particularly those with narrow toes. A bunion begins as a painful and tender spot over one of the metatarso-phalangeal joints; the part gradually enlarges, and there are indications of an effusion into a natural bursa or a newly formed sac. The progress of the affection may stop here, the bursa remaining, and serving to protect the subjacent parts from pressure. Thickening of the periosteum may result in enlargement of the articular ends of the bones and permanent deformity.

In its early stage the treatment must be palliative. Pressure must be removed and wet dressings applied. If pus forms, the swelling must be incised. Ulceration must be treated as any similar wounds (q.v.). Excision of diseased bone or even amputation may be required. The ulcers resulting from a suppurating bunion are very difficult to heal in old persons whose circulation is feeble. Such ulcers, under the best treatment, not very infrequently form the starting point for senile gangrene. Orthopedic measures consist in wearing shoes with broad, rounded toes, and straight inside borders. The great toe may be pulled into place and held there by means of adhesive plaster strips, and pledgets of wool worn between the first two toes.

BUNKER. See MENHADEN.

BUNKER HILL, BATTLE OF. The first severe battle of the American Revolution, fought June 17, 1775, on Breed's Hill and Bunker Hill, Charlestown, Mass., between about 3000 British troops under General Howe and about 1500 Americans under Col. William Prescott. On the night of the 16th Prescott was sent to fortify Bunker Hill, the possession of which would compel the evacuation of Boston by the British; but he threw up an earthwork on Breed's Hill instead, and there awaited the English attack. On June 17, at 3 P.M., the British charged up the hill, but were driven back with great loss. A second charge also was repulsed. At 4.30 o'clock, however, the British advanced again, and this time, the powder of the Americans being spent, succeeded in dislodging Prescott's men and forcing them from the field. The losses in killed, wounded, and missing were 1054 (including 95 officers) for the British, and about 450 for the Americans. Among those killed on the American side was General Warren. In the course of the engagement Charlestown was set on fire by British shells and was burned to the ground. Though Howe secured a strategic point which enabled him to retain his hold on Boston, the battle was morally a victory for the Americans, in that it demonstrated their fighting capacity and greatly increased the spirit of resistance throughout the country. The best account

of the battle is probably that in Richard Frothingham, *Siege of Boston* (Boston, 1902). Consult, also, G. E. Ellis, *History of the Battle of Bunker's (Breed's) Hill* (Boston, 1875); an excellent and discriminating article by C. F. Adams, Jr., in vol. i of *The American Historical Review* (New York, 1896); Edward Channing, *History of the United States*, vol. i (New York, 1907); and Greene, *The Revolutionary War and the Military Policy of the United States* (New York, 1911). The maps in Avery, *History of the United States and its People*, vol. vi (Cleveland, 1909), are particularly useful.

BUNKER HILL MONUMENT. A shaft in the form of an obelisk commemorating the battle of Bunker Hill, June 17, 1775. It stands on the battle ground on Breed's Hill (now generally called Bunker Hill), Boston. The shaft is of Quincy granite 221 feet high with interior stairs, and an outlook at the summit. General Lafayette assisted in laying the corner stone in 1825, on which occasion Daniel Webster delivered an oration. The monument was formally dedicated in 1843, Webster being again the chief speaker.

BUNKUM. See BUNCOMBE.

BUNNER, HENRY CUYLER (1855-96). An American novelist and humorist, editor of *Puck* from almost its beginning till his death. After a brief experience of business life he essayed journalism on the staff of the short-lived *Arcadian*, and passed thence in 1877 to the editorial office of *Puck*. His best claim to remembrance is as novelist, story-writer, and poet. Both *The Midge* (1886) and *The Story of a New York House* (1887) showed a sympathetic feeling for the artistic elements in New York life, but his talent was even more marked in short stories. Of several volumes of these stories, the most popular were: *Zadok Pine* (1891); *Short Sives* (1891), a very clever adaptation of stories from the French: *More Short Sives* (1894); *Love in Old Clothes* (1896); and *Jersey Street and Jersey Lane* (1896). Of notable interest is *Made in France* (1893), stories adapted from Maupassant (q.v.) with a skill that occasionally betters the French originals. Representative verses of Bunner's are collected in *Airs from Arcady* (1894). He wrote also a play, *The Tower of Babel* (1883).

BUNSEN, būns'en, CHRISTIAN KARL JOSTAS. BARON (1791-1860). A German scholar and diplomatist. He was born Aug. 25, 1791, at Korbach, in the Principality of Waldeck, and studied philology at Göttingen under Heyne. He taught in the Latin school there and was private tutor to W. B. Astor, of New York, with whom he traveled in Germany in 1813. To extend his knowledge of the Teutonic tongues, Bunsen went to Holland and afterward to Copenhagen. The work and character of Niebuhr (q.v.) aroused his enthusiasm, and he spent some months of 1815 in Berlin in the company of the historian. In 1816 he went to Paris and studied Persian and Arabic under Sylvestre de Sacy, and in the same year removed to Rome, where he married. Niebuhr, then Prussian Ambassador, took the greatest interest in the scientific pursuits of Bunsen and procured (1818) his appointment as Secretary to the Embassy. While Frederick William III was in Rome in 1822, he formed a favorable opinion of Bunsen's ability and character and requested him to continue in the state service. On Niebuhr's departure from Rome (1824) Bunsen conducted the embassy provision-

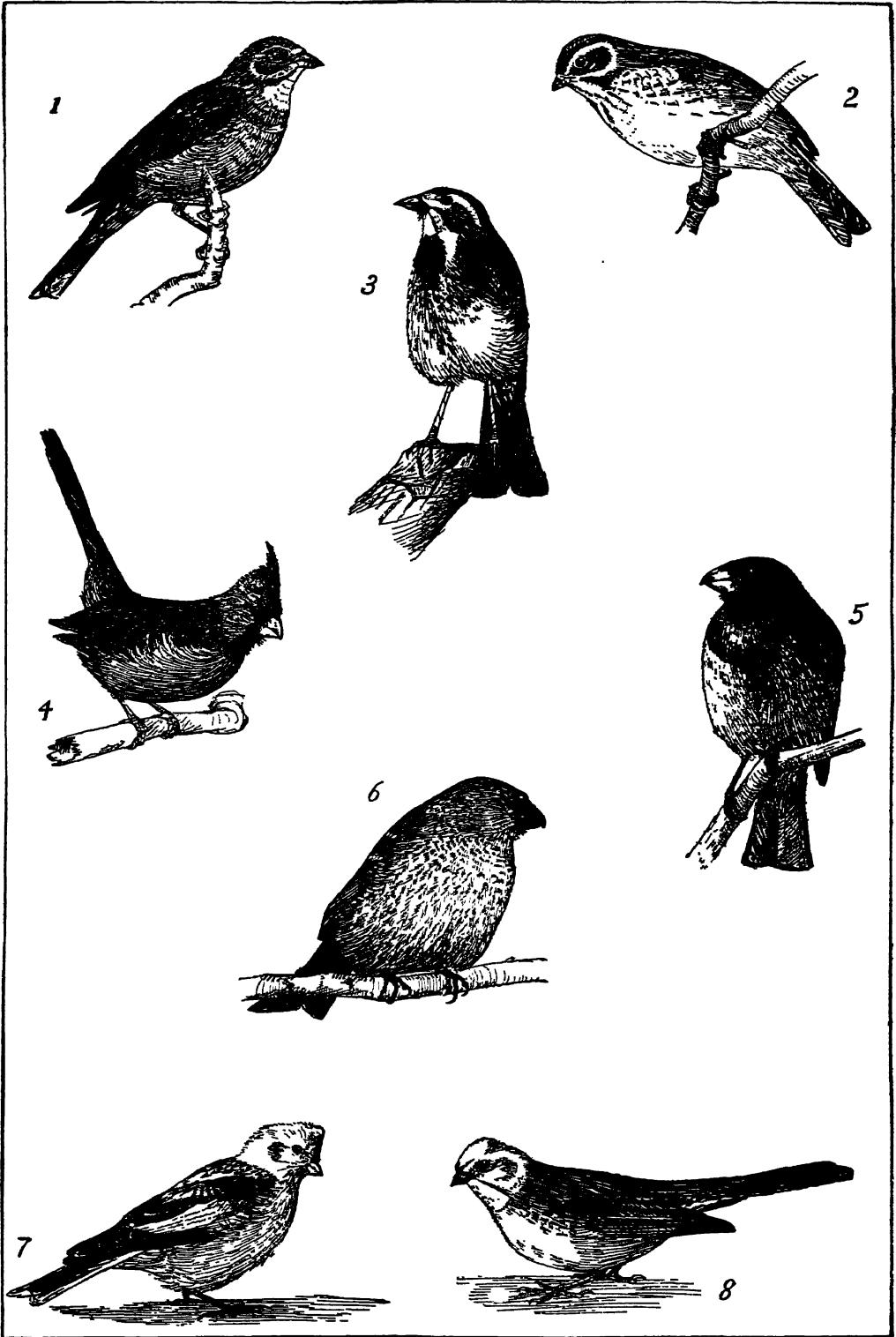
ally for a time and was then appointed Resident Minister (1827), but, becoming involved in a court intrigue against Baron Droste, he resigned his post in 1837. Living in intimate intercourse with Niebuhr, Bunsen had employed the time in prosecuting his investigations into the philosophy of language and religion and had made, on the one hand, the philosophy of Plato and the constitutions of antiquity and, on the other, biblical inquiries, church history, and liturgies, objects of special attention. Though not within the scope of the great plan of his life, he contributed largely to the *Beschreibung der Stadt Rom* (3 vols., 1830-43), the greater part of the topographical communications on ancient Rome, and all the investigations into the early history of Christian Rome. The first visit of the Egyptologist Champollion (q.v.) to Rome formed an epoch in Bunsen's antiquarian studies. He became himself a zealous auditor of Champollion and also encouraged Lepsius in the study of hieroglyphics. The Archæological Institute, established in 1829, found in Bunsen its most active supporter. He founded the Protestant hospital on the Tarpeian Rock in 1835. During his residence in Rome he contributed largely to the revision of the Lutheran liturgy.

In 1841 Bunsen was sent on a special mission to London and was shortly afterward appointed Ambassador at the English court. In Berlin, in 1844, he was asked to set forth his views on the question of granting a constitution to Prussia; and he presented a series of memorials representing the need of a deliberative assembly and also made a plan of a constitution modeled on that of England. In the Schleswig-Holstein question Bunsen strongly advocated the German view, in opposition to Denmark, and protested against the London protocol of 1850, although he was prevailed upon to sign that of 1852 respecting the succession in Denmark and Schleswig-Holstein. In the midst of all his political duties Bunsen continued unabated his literary and philosophical pursuits, the results of which appeared from time to time. Because he differed from his government as to the part Prussia should take in the Eastern question (q.v.) Bunsen ceased in 1854 to represent Prussia at the court of England and retired to Heidelberg. He had a deep appreciation of English national characteristics. In England he was regarded by those who knew him as the most philosophical and most reverent of lay theologians. His chief works are: *De Jure Atheniensium Hereditario* (1813); *Die Kirche der Zukunft* (Eng. trans. and published by Longman, 1845); *Ignatius von Antiochien und seine Zeit* (1847); *Die drei echten und die vier unechten Briefe des Ignatius von Antiochien* (1847); *Aegyptens Stelle in der Weltgeschichte* (Eng. trans. by Cottrell, 1845-47); *Die Basiliken des christlichen Roms* (1843); *Hippolytus und seine Zeit* (1851); *Christianity and Mankind* (1854); *Gott in der Geschichte* (1857); *Vollständiges Bibelwerk für die Gemeinde* (9 vols., 1858-70). This Bunsen hoped to make his chief work, but he completed only the first, second, and fifth volumes, the others being from his notes by Holtzmann and Kamphausen. Bunsen was created a baron in 1857, and died in Bonn, Nov. 28, 1860. Consult: L. Von Ranke, *Aus dem Briefwechsel Friederick Wilhelms IV Mit Bunsen* (Berlin, 1873); also, *A Memoir of Baron Bunsen*, by his wife (London, 1868).

BUNSEN, FRANCES, BARONESS (1791-1876). The wife of the preceding, of whom she published a biography under the title *A Memoir of Baron Bunsen, Drawn Chiefly from Family Papers, by his Widow, Frances, Baroness Bunsen* (1868). She was an Englishwoman by birth. Consult Hare, *Life and Letters of Frances, Baroness Bunsen* (2 vols., London, 1879; Ger. trans. by Hans Thorau, 7th ed., Gotha, 1899).

BUNSEN, ROBERT WILHELM (1811-99). A distinguished German chemist. He entered the University of Heidelberg and devoted himself to the study of geology, chemistry, and physics. He afterward continued his studies in Paris, Berlin, and Vienna. After having held the post of professor in Cassel, Marburg, and Breslau, successively, he was, in 1852, appointed to the chair of chemistry at the University of Heidelberg, where he remained until 1889, when he retired from active service. Bunsen's discoveries have formed important contributions to the progress of science in the latter part of the nineteenth century. His discovery, jointly with Kirchhoff, of the method of spectrum analysis, has led to the discovery of the alkali metals cesium and rubidium and, more recently, of a number of other elements; with the aid of the spectroscopic we are enabled further to analyze the fixed stars by analyzing the light we receive from them and ascertaining the lines characteristic of the several elementary substances composing the visible universe. Bunsen's flame tests (see ANALYSIS and FLAME) have formed another method in analytical chemistry. The flame reactions are usually observed with the aid of the well-known burner of Bunsen's invention, which furnished a smokeless, nonluminous flame of high temperature; the principle of the Bunsen burner is now extensively utilized in the household for cooking purposes. Bunsen also carried out a series of interesting researches on the double cyanides; and the cacodyl (q.v.) groups discovered by him soon after Wöhler and Liebig had discovered the benzoyl group, served to confirm the idea that the nature of an organic compound depends upon the radicals of which it is composed—one of the fundamental principles of modern organic chemistry. He further devised a process for making the metal magnesium on a large scale and showed how to obtain an exceedingly brilliant light by burning magnesium wire; discovered the fact that hydrated oxide of iron is an excellent antidote for arsenic poisoning, etc. Only a few of his more important contributions to physical chemistry can be mentioned here. He investigated the absorption of gases by liquids at different temperatures and under different pressures; he showed that the melting temperature of substances which, unlike water, expand during the change from the solid to the liquid state, rises with increase of external pressure; he studied the chemical distribution of a given gas between two other gaseous substances, when exploded with a mixture containing an excess of either; invented the ice calorimeter, which is often indispensable in thermochemical determinations; jointly with Roscoe, he adapted John W. Draper's actinometer for use in work of precision, and, by the use of the improved instrument, carried out, together with Roscoe, a series of important photochemical measurements. He invented also a filter pump, a photometer, a galvanic cell, and other useful apparatus. Among his publications may be mentioned: *Gasometrische Methoden* (1857); *Chem-*

BUNTINGS AND GROSBEAKS



1. ORTOLAN (*Emberiza hortulana*).
2. REED BUNTING (*Emberiza schoenicus*).
3. DICK-CISSEL (*Spiza americana*).
4. CARDINAL GROSBEAK (*Cardinalis cardinalis*).

5. ROSE-BREASTED GROSBEAK (*Habia ludoviciana*).
6. PINE GROSBEAK (*Pinicola enucleator*).
7. SNOW BUNTING (*Plectrophenax nivalis*).
8. YELLOW BUNTING (*Emberiza citrinella*).

ische Analyse durch Spektralbeobachtungen (jointly with Kirchhoff, 1861); *Flammenreaktionem* (1880). Consult Debus, *Erinnerungen an Robert Wilhelm Bunsen* (Kassel, 1901); *Gesammelte Abhandlungen* (Leipzig, 1904).

BUNT (perhaps a corruption of *burnt*). A disease of wheat due to a parasitic fungus, *Tilletia tritici* or *Tilletia foetens*. Bunt is also called stinking smut, pepper brand, and sometimes smut ball. Wheat attacked by this fungus assumes a bluish-green color, and the plants never take on the characteristic color of ripened grain. The individual grains in the head are attacked, and if broken open will be found filled with black spores of a peculiar fetid odor, hence the name of stinking smut. It is one of the most common and injurious diseases of wheat, often affecting a great part of a crop, although its prevalence has been greatly diminished by care on the part of the farmers, and particularly by the selection of clean seed, and the dressing of the seed, before sowing, with some substance which, without injuring its vitality, destroys that of the spores of the fungus. Even washing with water has a good effect, but the best results are secured by treating the seed wheat with solutions of copper sulphate, formalin, or the hot-water method, as recommended for smut (q.v.). Bunt is believed to be disseminated by contact of sound with unsound grain, by threshing, which causes the bunt spores to fly about, or by manure in which the straw of infected grain has been mixed. Upon this knowledge the means now adopted for its prevention are founded. A considerable mixture of bunt is not supposed to render flour absolutely unwholesome, at least when made into fermented bread, but the bread is of peculiar flavor and very dark color.

BUNTER, bönt'er (shortened from Ger. *bunter Sandstein*, variegated sandstone). A series of rocks occurring in Europe, where it constitutes the lowest member of the Triassic system. In central England it includes mottled sandstones and conglomerates, with a maximum thickness of about 1700 feet, which rest unconformably on Permian and Carboniferous strata. The Bunter attains its greatest development in Germany, particularly in the Black Forest, the Vosges, and in the central and northern parts. Here the prevailing rocks are variegated sandstones and conglomerates, which grade towards the top into limestones and marls, and at the base pass insensibly into the Permian sandstone. The plant life included ferns, cycads, and conifers; the animal life was characterized by the prevalence of batrachians, the most typical forms being the labyrinthodonts. See *STEGOCEPHALIA*.

BUNTING (origin uncertain). A light, loosely woven woolen material, of which the flags and signals of ships are usually made, and which is also used for women's dress goods.

BUNTING (origin obscure). One of a group of seed-eating birds, sometimes classified as the family *Emberizidae*, intermediate between the finches and the starlings. The most marked characteristics are a short, straight, conical bill, angular gape, and a hard, rounded knob on the inner surface of the upper mandible. The typical species is the British corn bunting (*Emberiza calandra*, or *miliaria*)—a bird considerably larger than a house sparrow, brown, with darker streaks on the upper parts, whitish brown, with spots and lines of dark brown on the under parts, and with a slightly forked tail. It is numerous, particularly in low, cultivated grounds, in most

parts of Europe, extending also into Asia, living in pairs during spring and summer, but in flocks in winter and often visiting barnyards at that season, along with chaffinches and sparrows. This bunting often passes the night on the ground in stubble fields, and is taken in the nets employed for catching larks, and brought with them to market. It usually builds its nest on or very near the ground. Its notes are harsh and unmusical. The reed bunting (*Emberiza schoeniclus*) is common in marshy situations; a very pretty little bird with black head and throat, strikingly contrasted with the white nape and sides of the neck. The ciril bunting (*Emberiza cirius*), of which the head is olive green, with black streaks and with patches of bright lemon yellow on the cheeks and over the eyes, belongs chiefly to the south of Europe and the north of Africa. Other common European species are the yellow-hammer (*Emberiza citrinella*) and the ortolan (*Emberiza hortulana*), elsewhere described. The term is little used popularly in America, but applied in the older books to several more or less related birds, as the snow bunting (q.v.), the black-throated bunting (see *DICKCISSEL*), the bay-winged bunting (see *VESPER SPARROW*), the lark bunting (q.v.), the cowbird, and bobolink. See *PLATE OF BUNTINGS AND GROSBEAKS*.

BUNTING, JABEZ (1789–1858). An English Wesleyan minister, sometimes called the "second founder of Methodism." He was born in Manchester and in 1809 entered the ministry, in which he was very successful in Manchester, London, Sheffield, Liverpool, and Leeds. He was president of the conferences of 1820, 1828, 1836, and 1844. In 1835 he was chosen president of the newly established Hoxton theological institution, and for more than 20 years was senior secretary of the Wesleyan Methodist Missionary Society. He was the chief authority in all matters relating to church government and policy, and his power became so great that the conference was virtually an embodiment of his will. The result was the schism, first of the Wesleyan Methodist Association and then of the Wesleyan Reformers. Consult the biography by his son (London, 1859); also Townsend, *New History of Methodism* (London, 1909). See *METHODISM*.

BUNTING, SIR PERCY WILLIAM (1836–1911). An English editor. He was educated at Owens College, Manchester, and Pembroke College, Cambridge, studied law, and became a barrister. In 1882 he was chosen editor of the *Contemporary Review* to which for many years he had contributed, and in this position he remained until the year of his death. A keen politician and active in the National Liberal Federation, he stood for Parliament in 1892, but was defeated. He also participated in modern social reform movements, exerting a wide influence in their behalf, and was a prominent member of the English Methodist church. From 1902 to the time of his death, in addition to his other duties, he edited the *Methodist Times*. He was knighted in 1908 for political services.

BUN'YA-BUN'YA, or **BUN'YA**. See *ABAUCAULA*.

BUN'YAN, JOHN (1628–88). The author of *The Pilgrim's Progress*. He was born in Elstow, near Bedford, 1628, and was brought up to his father's trade of tinker, spending his youth in the practice of that humble craft. It has generally been taken for granted that his early life was very loose and profligate, on the sole ground of his terrible self-accusations in after years,

when, from the height of religious fervor and Puritan strictness, he looked back on dancing and bell ringing as deadly sins. But there is no good reason for believing that he was in reality a bad character, and, like St. Augustine, he probably exaggerated his own rather venial faults. He served for a short time (probably 1644-46) in the Civil War and most likely on the side of Parliament; but beyond his taking some active part in the great struggle, nothing is precisely known. In 1648 or early the next year, he married, and through the influence of his wife and her "godly books" there was brought about a complete reformation in his life. In 1653 he joined the Nonconformist body of which she was a member, and two years later he removed to Bedford. There the wife to whom he owed so much died. In 1657 he was formally recognized as a preacher. "All the midland counties," says Froude, "heard of his fame and demanded to hear him." After the Restoration it was made illegal to conduct divine service except in accordance with the forms of the Established church. Bunyan, who persisted in his irregular preaching, was confined in Bedford county jail for 12 years (1660-72), though during a part of this time he was allowed a large degree of freedom. Here he supported his family—he had married again—by making tagged laces. His library consisted of the Bible and Fox's *Martyrs*. He was again imprisoned for six months in 1673, when he probably finished *Pilgrim's Progress*. The immense popularity of this book has now waned, though certain characters in it form part and parcel of permanent literary allusion, such as "the Giant Despair," "Apollyon," and the rest. After his enlargement his fame as a preacher increased more and more till his death, which took place in London, Aug. 31, 1688. Though Bunyan is best known by *Pilgrim's Progress* (1st part, 1678; 2d part, 1684), he wrote much else. *The Life and Death of Mr. Badman*, which shows the rapid descent of a man from sin to sin, and *Grace Abounding*, a narrative of Bunyan's own spiritual life, are masterpieces in realistic literature, and *The Holy War* is a beautiful allegory. Among his sermons should not be forgotten "The Heavenly Footman." An excellent edition of Bunyan is that in the *Cambridge English Classics* (1906-07). Editions of *Pilgrim's Progress* are numerous. A facsimile reprint of the original edition was published (London, 1885). Consult: Brown, *John Bunyan: His Life, Times, and Works* (London, 1888), the standard biography; Froude, *John Bunyan* (New York, 1838); Venables, *Life of John Bunyan* (Oxford, 1888); W. H. White, *Life* (London, 1904); P. E. More, *Shelburne Essays* (6th series, New York and London, 1909); and Macaulay's famous essay. See ALLEGORY.

BUNZLAU, bōnts'lou (from Slav. *Boleslas*, so named after his founder). A town of Prussia, in the Province of Silesia, situated on the Bober, about 60 miles west-northwest of Breslau (Map: Prussia, F 3). An obelisk to the Russian General Kutusoff, who died here in 1813, adorns the market place. Its manufactures include tiles, pottery, glass, and linen. There are also stone-cutting establishments, iron foundries, and saw mills. It is the birthplace of the poet Martin Opitz. Pop., 1890, 12,921; 1900, 14,590; 1910, 16,129. Bunzlau was repeatedly captured and recaptured during the wars of the seventeenth century and in 1813 was the scene of the defeat of the French by the Silesian army.

BUOL-SCHAUENSTEIN, bō'ól shou'en-stin, KARL FERDINAND, COUNT (1797-1865). An Austrian statesman. After filling subordinate diplomatic posts, he became Ambassador at Karlsruhe in 1828, Stuttgart in 1838, and Turin in 1844. Leaving Turin on the outbreak of the Austro-Sardinian War in 1848, he went as Ambassador to St. Petersburg. In 1851 he represented Austria in London. On Schwarzenberg's death, Buol-Schauenstein was recalled to Vienna, and became Foreign Minister. In carrying out the wavering policy of Austria in relation to the Eastern question, he succeeded only in materially reducing that country's influence in European affairs, and showed himself a weak disciple of Metternich and Schwarzenberg. (See CRIMEAN WAR.) At the close of this war he participated in the Conference of Vienna and the Paris Congress. After defending in diplomatic notes and circulars the position which Austria had taken with reference to Sardinia, Buol-Schauenstein suddenly, on the actual commencement of the Italian campaign of 1859, resigned his place, which was filled by Count Rechberg. He died Oct. 28, 1865. Consult Friedjung, *Der Krimkrieg und die österreichische Politik* (Stuttgart, 1907).

BUONAROTTI, bwō'nā-rōt'tē, FILIPPO (1761-1837). An Italian revolutionist, born in Pisa. He was a devoted follower of Rousseau. In 1787 he founded a journal antagonistic to the government of Tuscany and was banished. He then withdrew to Corsica, where he established the paper entitled *L'Ami de la Liberté Italienne*. He brought about the annexation of the island of San Pietro to the Republic of France and became a French citizen and subsequently the founder and president of the Pantheon Society, which aimed at the restoration of the constitution of 1793. Upon the dissolution of this society by the Directory he became implicated in the conspiracy of Babeuf and was sentenced to deportation, but afterward was pardoned. He died in comparative obscurity. He published *Conspiration de Babeuf* (1828).

BUONAROTTI, bwō'nār-rō'tē, MICHELANGELO. See MICHELANGELO.

BUONCOMPAGNI, bwōn'kōm-pā'nyē, BALDASSARE, PRINCE (1821-94). An Italian scholar. He was born in Rome and was a descendant of the Princes of Piombino, who count among their members several cardinals and Pope Gregory XIII. In 1847 he became a member of the Pontifical Academy de' Nuovi Lincei, of which he was afterward appointed secretary and librarian. He published the following important works: *Della vita e delle opere di Guidone Bonatti, astrologo ed astronomo del secolo decimoterzo* (1851); *Della vita e delle opere di Leonardo Pisano* (1852); *Intorno all' opera d'Albiruni sull'India* (1869); *Bollettino delle scienze matematiche e fisiche* (1868-87). His remarkable library was catalogued by Narducci (Rome, 1892).

BUONFIGLIO, bwōn-fē'lyō, BENEDETTO. See BONFIGLIO.

BUONO. See BONO.

BUONONCINI, bwō'nōn-chē'nē, GIOVANNI BATTISTA. See BONONCINI.

BUONTALENTI, bwōn'tā-lēn'tē, BERNARDO, called BERNARDO DELLA GRANDOLE (1536-1608). An Italian painter, sculptor, and architect. He was born in Florence and studied with Bronzino, Vasari, Salviati, and Michelangelo. Although extremely versatile, he acquired fame

chiefly through his architectural works and fortifications. He designed the villas of Pratolino, Marignolle, and others for the Medici, the additions to the Palazzo Vecchio, the gallery connecting the Uffizi and Pitti palaces, and the Tribuna in the Uffizi. He completed and adorned the Boboli Gardens behind the Pitti Palace, begun by Tribolo. Among his other works may be mentioned the façade of Santa Trinità and the Palazzo Nonfinito in Florence, the Palazzo Reale in Siena, and the palace of the Grand Duke in Pisa. He was one of the foremost exponents of the baroque style of Italy.

BUOY, *boi*, *bōō'i*, or *bwoi*, or **BOY** (OF. *boye*, fetter, chain, Lat. *boia*, leather collar, Gk. *βόειος*, *boeios*, of oxhide, from *βούς*, *bous*, ox; alluding to its being fastened by a chain). A floating body intended as a mark for the limits of a channel, the position of a shoal, rock, wreck, or the like. It is made either of wood or metal. Buoys are moored by chains to heavy anchors or weights. It is the custom in northern latitudes, where more or less ice is expected in the winter season, to replace the hollow metal buoys by wooden *spar buoys* until the ice has disappeared, as there is less danger of the spar being swept away or damaged. Buoys are of different kinds and shapes, according to the purposes they are intended to serve—as *can buoys*, made of sheet iron, in the form of a cylinder, with a hemispherical base; *spar buoys*, made of a wooden spar or log which is anchored at one end; *nun buoys*, which are conical above water; *bell buoys*, surmounted by a bell which is rung by the action of the waves (there is usually no clapper, but iron balls roll about on a plate under the bell's mouth, and striking against the inner surface of the bell, make a noise that can be heard at a considerable distance); and *whistling buoys*, which are fitted with an apparatus by which air compressed by the move-

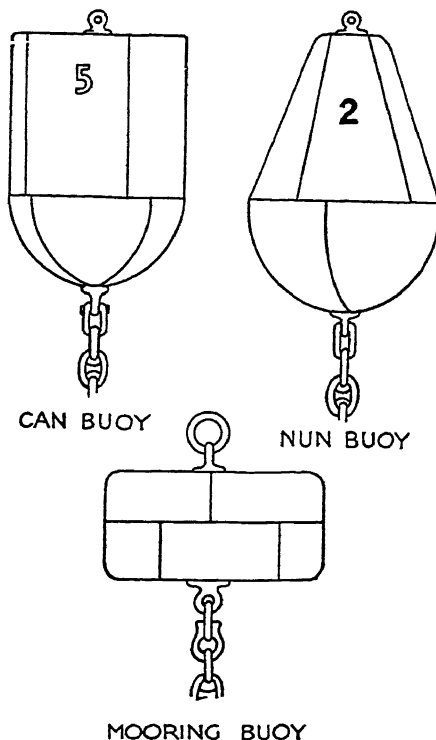
ments of the waves is made to escape through a whistle and so give warning of danger. Cages or shapes are sometimes put on buoys as further marks of distinction.

In the United States the following system of placing buoys as aids to navigation is prescribed by law: *Red* buoys mark the starboard or right-hand side of a channel when coming from seaward, and *black* the port or left-hand side; mid-channel dangers and obstructions are marked with *danger buoys*, having black and red transverse stripes, and *mid-channel* buoys marking the fairway have longitudinal black and white stripes; *wreck buoys* marking sunken

wrecks are painted green; *buoys marking anchorage limits* or *dumping limits* are painted white. The *quarantine buoy*, if there be one, is painted yellow. The starboard and port buoys are numbered from the seaward end of the channel in large white or black numbers, odd white numbers on the black buoys and even black numbers on the red.

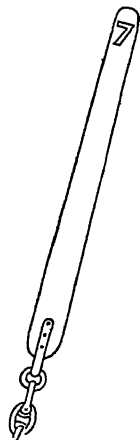
The *life buoy* now in common use in the navy consists of a hollow copper ring having

on each side a long tube swinging freely on a pivot and weighted so as to keep in a vertical position. In the bulb at the bottom of each



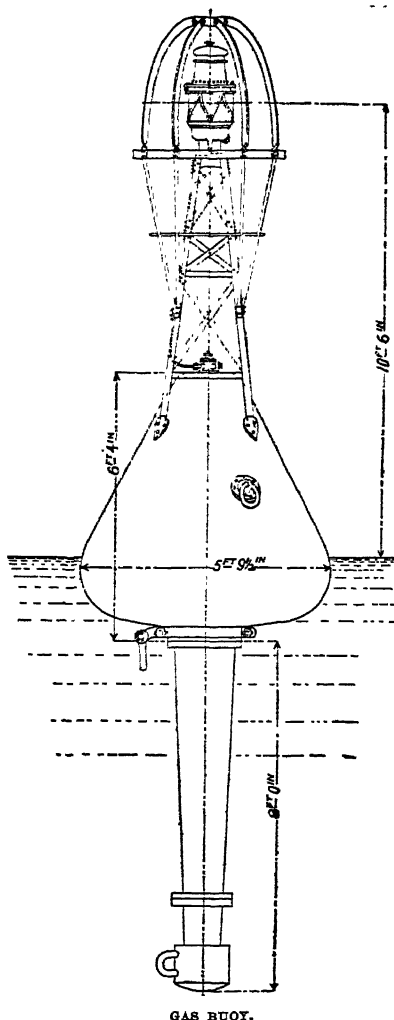
tube there is a burning composition which takes fire upon contact with the water, the gas burning at the top of the tube with a bright flame which can be seen at a considerable distance at night. This machine is hung over the side of the vessel near the stern and is dropped by means of a trigger.

An *anchor buoy* is a small metal buoy made fast to the anchor by means of a rope, and it is used to mark the position of the anchor, so that should the riding chain (the chain the ship hangs by) part, the whereabouts of the anchor is still indicated by the buoy, and it may be recovered. *Gas buoys* are used for marking certain important channels, thus permitting the safe entrance and exit of vessels at night. They are provided with a reservoir of compressed illuminating gas under a pressure of 150 to 180 pounds per square inch, which is sufficient to last from 85 days to a year, according to the size of the buoy and the degree of compression of the gas. The cost is estimated at less than seven cents per day (the light is not extinguished night or day) and the reservoir may be filled in a few minutes by means of a hose leading from the gas tanks of the supply steamer or buoy tender. The body of the buoy is sufficiently large to give proper buoyancy and is held upright by a centre weight at the bottom. On top of it there is a wrought-iron tower, about 6 feet high, upon which is mounted a Fresnel lens lantern, which is protected by a wire cage. A filling valve and a regulating valve are provided. The lanterns may be so made as to give flashes of different duration or of different colors. They may be seen from 6 to 8 miles. Some gas



SPAR BUOY

buoys are fitted for generating and burning acetylene gas. They are frequently made to carry a charge sufficient to last six months or more. *Electrically lighted buoys* have been used



GAS BUOY.

in United States harbors since 1888. They have replaced gas buoys in certain localities, particularly when there is much floating ice, for the electric lights may be placed on the ends of spars designed specially for winter service. The cables require protection or armoring; but, if properly equipped, electric buoys give good results.

BUOYANCY (for derivation, see *ΒΟΥΥ*). The quality which causes a body to float or tend to float in a liquid and depends upon the relative densities of the liquid and body. The centre of buoyancy is the point at which all forces which produce the buoyant effort (i.e., those which resist the tendency of an object to sink) may be considered to act. When the floating object is at rest in stable equilibrium, the centre of buoyancy is in the same vertical line as the centre of gravity and at a distance above it. See *STABILITY*; *HYDROSTATICS*.

ΒΥΨΑΛΙΟΣ (Gk. *Βούψαλος*, *Boupsalos*) and **ΑΘΗΝΙΣ** (**Αθηνης*). Sons of Archermus of

Chios, famous sculptors of the time of Hipponax (B.C. 540), who, working together, produced draped female figures, especially statues of Artemis in Chios and Lasos, and marble statues at Delos. With figures by their hands, Augustus adorned the gable of the temple he erected to Apollo on the Palatine. They are said to have made a caricature of Hipponax, who retorted with verses of bitter satire. See *HIPPOXAX*.

ΒΥΦΘΟΝΙΑ (Gk. *τὰ βυφθόνια*, *ta bouphonia*, from *βούς*, *bous*, ox + *φόνος*, *phonos*, slaughter). An ancient Athenian sacrificial ceremony, consisting of the slaying of an ox, performed at the Dipolia (q.v.).

BUR. The slight ridge of metal raised on the edges of a line engraved either by the burin, the rocker, or the dry point (qq.v.). This is removed usually by a scraper, as it retains too much ink in printing the plate and produces the effect of a blur or a smear. Seymour Haden and other etchers often retain it for enriching their shadows. Plates by Rembrandt show that he also made use of it for this purpose. In mezzotint engraving the bur raised by the rocker contributes the chief effect. Left standing, it furnishes the heavy shadows; its partial or entire removal gives the different degrees of light. See *ETCHING*; *MEZZOTINT*.

BURANO, *bōō-rā'nō*. A city in north Italy, 5 miles northeast of Venice, on an island of the same name in the Lagoons (Map: Italy, G 2). The chief industries are market gardening, boat building, and fishing. There is here a royal school employing 500 girls in making a quality of lace that has been famous since the fifteenth century. To Burano belongs Torcello, on an adjacent islet, with two museums of antiquities, and a cathedral built in the seventh century, rebuilt in 864 and partially rebuilt in 1008 and containing valuable mosaics. Pop., 1881 (commune), 6800; 1901, 8169; 1911, 8631.

BURAUEN, *bōō-rou'en*. A town of Leyte, an island of the Philippines, situated 26 miles south by west of Tacloban, near the left bank of the Dao River (Map: Philippine Islands, E 5). There are important sulphur deposits in the vicinity. Pop., 1903, 18,197.

BURBAGE, *būr'bij*, or **BURBADGE**, *RICARD* (c.1567-1619). An English actor. He was the son of James Burbage, an actor and the builder of the first theatre in London, and before 1590 he had acquired reputation as a tragedian, though little absolutely authentic information concerning him exists before 1603, in which year his name appears as one of the leading members of the Lord Chamberlain's company together with that of Shakespeare. Some years before this (1599) Burbage had erected the Globe Theatre, associating with himself Shakespeare and others. At the Globe Theatre and at the Blackfriars, which he also owned, he continued to act till his death, achieving an unchallenged reputation as the foremost English player of his day. His chief aptitude was for tragic rôles, and there is little doubt that he was one of the earliest, if not the earliest, of Hamlets, Lears, and Othellos. His most successful impersonation seems to have been that of Richard III. He also appeared in the most important plays of Ben Jonson, Beaumont and Fletcher, and Webster. Trustworthy evidence ascribes to him unmatched power of vocal and facial expression and a capacity for thoroughly sinking his personality into his rôle. He was also an excellent painter in oils, the Felton portrait of Shakespeare being

attributed to him. Consult Stopes, *Burbage and Shakespeare's Stage* (London, 1913).

BURBANK, ALFRED POST (1846-94). An American elocutionist. He was born in Chicago, where he received his university education. At the age of 17 he enlisted in the army, serving in Tennessee. He afterward devoted himself to teaching and was long associated as principal with the Dearborn and Douglas public schools of Chicago. Later he made frequent tours as a professional reader through every portion of the United States and also visited London. He edited *A Collection of Humorous, Dramatic, and Dialect Selections* (1878).

BURBANK, LUTHER (1849-1926). An American nurseryman and plant breeder, of international fame for his extensive and skillful development of new forms of plant life through the processes of selection and cross fertilization. He was born on a farm at Lancaster, Mass., and was educated in the local academy. As a youth he began market gardening and seed raising in a small way and developed the Burbank potato, now an important standard variety in the Pacific coast region. In 1875 he established a nursery at Santa Rosa, Cal. His genius and love for the production of improved varieties of fruits, vegetables, and ornamentals caused him to give up a successful nursery business in 1893 and to undertake an extensive series of plant-breeding experiments, many of which are still incomplete. The numerous fruits, vegetables, flowers, and forage plants which Burbank has sent out, each involving the handling of countless seedlings, cannot be mentioned here. Some of these, such as the Burbank potato and many Japanese forms of plums, have proven to be of great commercial importance. Probably his greatest achievement, however, lies in the awakening of a universal interest in plant breeding.

Consult: W. S. Harwood, *New Creations in Plant Life; Life and Work of L. Burbank* (New York, 1907); Jordan and Kellogg, *The Scientific Aspects of Luther Burbank's Work* (San Francisco, 1909).

BURBOT (corruption of Fr. *barbote*, from Lat. *barba*, beard, referring to its barbels). The only fresh-water fish (*Lota lota*) belonging to the Gadidae, a family including the cod, haddock, pollock, etc. It occurs in certain rivers of England, northern Europe, and in Asia. It never enters salt waters. It may grow to a weight of 12 pounds, but in English waters it is usually about one-fifth as great. The burbot, like the ling (q.v.), has an elongated form; the head is rather broad, and the tapering posterior of the body compressed. It is covered with very small, imbedded scales. The mouth is large, and the chin has a well-developed barbel. The first of the two dorsal fins is short, the second very long, and the anal fin is also very long. The caudal fin is rounded. The American burbot (*Lota maculosa*), which occurs in the lakes and sluggish streams of the northern and eastern portions of America, is probably identical with the European burbot.

BURBRIDGE, STEPHEN GANO (1831-94). An American soldier. He was born in Scott Co., Ky., and was bred to the law, but engaged in mercantile business and farming. When the Civil War began, he entered the Union service and was distinguished for bravery in many engagements. He was promoted brigadier general of volunteers at Shiloh and earned the brevet rank of major general of volunteers by defeat-

ing General Morgan and his raiders in 1864. He resigned in 1865 and retired to private life in Kentucky.

BURCH, CHARLES SUMNER (1854-1920). An American Protestant Episcopal clergyman. Born in Pinckney, Mich., he graduated at the University of Michigan in 1875 and entered the publishing business in Chicago. From 1897 to 1905 he was editor of the Grand Rapids *Evening Press*. He had taken deacon's orders in 1895 and was ordained priest in 1905. After being rector of St. Andrew's, Staten Island, N. Y., for six years, he was consecrated suffragan Bishop of New York in February, 1911.

BURCHARD, SAMUEL DICKINSON (1812-91). An American Presbyterian clergyman, born in Steuben, N. Y. He graduated at Centre College in 1836 and soon became prominent in Kentucky as an antislavery and temperance lecturer. He became pastor of the Houston Street Presbyterian Church in New York City in 1839 and of the Murray Hill Church in 1879, but in 1885 he withdrew from active work and became pastor emeritus. On Oct. 29, 1884, towards the end of the bitter Blaine-Cleveland presidential campaign, he was the spokesman of a large party of clergymen of all denominations, who waited upon Blaine at the Fifth Avenue Hotel in New York City to assure him of their support. Towards the end of his generally temperate address he characterized the Democratic party as the party of "Rum, Romanism, and Rebellion." This unfortunate alliteration, which Blaine did not at the time take the pains to repudiate, was immediately made use of by the Democrats as campaign material. The words were printed on leaflets which were spread broadcast among the voters, flaring placards, ringing endless changes on the letters "R. R. R.," were exhibited in all the large cities, and the Democratic press persistently attributed the sentiment to Blaine himself and charged him with being a rabid anti-Catholic. It is generally believed that the phrase alienated enough Catholic voters in New York State alone, where the Democratic majority was only 1047 votes, to turn the national election, which hinged on the electoral vote of New York, to Cleveland.

BURCHARDI, BURKHARD, GEORG CHRISTIAN (1795-1882). A German jurist. He was born at Ketting, in the island of Alsen, was educated at the universities of Kiel, Berlin, and Göttingen, and became professor of law at Bonn in 1819. His numerous contributions to the history and nature of Roman law are important. His principal publication is *Die Wissenschaft und Kunst der Rechtsfindung* (1869). He also wrote *Entwurf eines Systems des römisch-justinianischen Rechts* (1819), and *Lehrbuch des römischen Rechts* (2 parts, 1841-47).

BURCHELL, WILLIAM JOHN (c.1782-1863). An English explorer and naturalist, born in Fulham. He was "schoolmaster and acting botanist" on the island of St. Helena for the East India Company from 1805 to 1810 and then proceeded to South Africa. Here in the course of several years of solitary exploration he accumulated a collection of 63,000 natural objects, 500 drawings, and much material on astronomical, meteorological, and other subjects. Many of the specimens collected on this journey are now in the British Museum. In 1825 he made an extended tour through South America, where also he was generally unattended. He proceeded through the Province of Goyaz as far

as Porto Real and Pará. The entomological collection alone, which he accumulated on this journey, is said to have been eight or nine times as large as that previously made in Africa. In recognition of his valuable services to science, many of the animal and vegetable species discovered by him were named in his honor. He published *Travels in the Interior of Southern Africa* (1822).

BURCHIELLO, böör-kyél'lo, DOMENICO (1404-1449). An early Italian satiric poet, whose real name was Domenico di Giovanni. He kept a barber shop in Florence, which was a favorite place of meeting for a circle of artists and men of letters. Subsequently he lived in great poverty in Siena and finally died in Rome. Burchiello is interesting as illustrating the type of burlesque poetry prior to Berni. His favorite form was the *sonnetto caudato*, or sonnet with a tag of three extra lines. His poems are written in the current slang of his day and satirize with vivacious humor people and conditions of the time. A favorite comic device of Burchiello is to assemble inappropriate expressions in nonsensical combinations, a type of wit that is still called *burchiellesque*. The difficulty of understanding his jokes is proverbial. Of editions of his sonnets, may be mentioned, *Sonnetti del Burchiello, del Bellincioni e d'altri poeti fiorentini* (London, 1757). Consult Gargani, *Sulle Poesie del Burchiello* (Florence, 1877) and Mazzi, in *Propugnatore*, vols. x-xi.

BURCKHARD, böörk'härt, MAX EUGEN (1854-1912). An Austrian poet and writer on jurisprudence, born in Korneuburg. After university study in Vienna, he became a member of the Ministry of Education, and in 1890 director of the Vienna Court Theatre, on whose black list he placed the dramas of Ibsen, Hauptmann, and Sudermann. His publications include, in verse, *Das Lied vom Tannhäuser* (1888), and, in prose, *Gesetze und Verordnungen in Kultussachen* (1887); *Das Recht des Schauspielers* (1896); *Theater* (1905), a volume of criticism; the comedies, *Rat Schrimpf* (1905), *Im Paradiese* (1907), *Die verflixten Frauenzimmer* (1909), *Jene Asra* (1910); the novels, *Gottfried Wunderlich* (1906; 3d ed., 1909), *Trincaria* (1910), and also *Cillis—Sina—Gabrielle: Briefe von und an Carl Rahl* (1912).

BURCKHARDT, HEINRICH (1811-79). A German forester, born in Adelebsen. He studied at the University of Göttingen and entered the government service of Hanover as an underforester. In 1858 he was appointed director of forests as a member of the Ministry of Finance. When Hanover was consolidated with Prussia (1866), he was retained as a Prussian chief ranger. He wrote *Forstliche Hilfstafeln* (3 parts, 1852-58); *Säen und Pflanzen* (1855; 6th ed., 1892); *Der Waldvert in Beziehung auf Veräusserung* (1860); *Die Teilforsten* (1876).

BURCKHARDT, JAKOB (1818-97). A Swiss historian. He was born in Basel, studied history and theology at the universities of Basel and of Berlin, and was appointed professor of the history of art and civilization in the former. He afterward accepted a call to the new Polytechnic Institute of Zürich, but returned after a few years to Basel. His works, characterized alike by thorough research, sound learning, and an excellent style, include: *Die Zeit Konstantins des Grossen* (1853); *Cicerone* (1855; 8th ed. by W. Bode, 1901; Eng. trans. of the part relating to Painting, New York, 1910), a kind of guide-

book, containing a history of art in Italy, together with descriptions of the more important art works of that country; *Die Kultur der Renaissance in Italien* (1860; 8th ed., 1902; Eng. trans., 2 vols., London, 1876, an invaluable manual); *Geschichte der Renaissance in Italien* (3d ed., 1890-91); *Griechische Kulturgeschichte* (3 vols., 1898-1900). Consult his biography by Trog (Basel, 1898).

BURCKHARDT, JOHANN KARL (1773-1825). A mathematician and astronomer, born in Leipzig. He studied at the University of Leipzig, pursued a course in astronomy under Zach in Gotha, and was appointed assistant astronomer in the Bureau des Longitudes, Paris. In 1807 he became the director of the observatory of the Ecole Militaire. His treatise on the comets of 1770 was crowned by the Academy. His lunar tables (1812) were long the best. He translated into German a part of Laplace's *Mécanique céleste* and published several valuable astronomical treatises.

BURCKHARDT, JOHN LEWIS (1784-1817). An explorer in the service of the African Association of London. He was born in Lausanne, Switzerland, of English parentage; was educated in Leipzig and Göttingen, and in 1806 went to London, where he was introduced by Sir Joseph Banks to the African Association, which sent him to explore the interior of Africa. From Malta he proceeded, under the disguise of an Oriental, to Aleppo, where within two years he became so proficient in the vulgar Arabic that he could safely travel as an Oriental merchant. He visited Palmyra, Damascus, and the Lebanon, and went through Palestine to Cairo. In 1814 he traveled through the Nubian Desert to the shore of the Red Sea and then from Jiddah proceeded to Mecca and visited the Prophet's tomb at Medina. In 1815 he returned to Cairo and in the following year ascended Mount Sinai. Just as he was about to set out from Cairo on a journey to the Sudan, he was seized with dysentery and died within a few days. As a holy *sheik*, he was buried with all funeral honors by the Turks in the Moslem cemetery. His collection of Oriental manuscripts, in 350 volumes, was left to the University of Cambridge. His journals of travel, remarkable alike for their interest and evident truthfulness, were published by the African Association. He published: *Travels in Nubia*, with a biographical introduction (1819); *Travels in Syria and the Holy Land* (1822); *Travels in Arabia* (1829); *Notes on the Bedouins and Wahabys* (1830); *Arabic Proverbs* (1830).

BURCKMAIR, böörk'mir. See BURCKMAIR.
BURDACH, böör'däg, KARL FRIEDRICH (1776-1847). A German physiologist, born in Leipzig. He was graduated in medicine there in 1800; became professor of physiology in the University of Dorpat in 1811, and four years later took a similar position in Königsberg. Among his works are: *Diatetik für Gesunde* (1805); *Enzyklopädie der Heilwissenschaft* (3 vols., 1810-12); *Vom Bau und Leben des Gehirns und Rückenmarks* (3 vols., 1819-25); *Die Physiologie als Erfahrungswissenschaft* (1826-40).

BURDEKIN. The finest river in Queensland, Australia (Map: Queensland, E 6). It is 350 miles long, drains an area of 53,500 square miles, and flows into Upstart Bay, on the Pacific Ocean.

BURDEN (AS. *byrfen*, Icel. *byrfr*, Ger. *Bürde*, load, from the root of *bear*, AS. *beran*; cf.

Gk. *phópros*, *phortos*, load, from *phérew*, *pherein*, to carry). As a legal term, an obligation resting either upon a party to a law suit, as in the expression, "burden of proof" (q.v.), or upon an estate in land, as in the terms "servitude" and "incumbrance" (q.v.). It does not in our legal systems denote a personal obligation. In Scottish law, however, the term is used to signify any restriction, limitation, or incumbrance affecting either person or property, the burden being called *real* when it is a charge upon lands, and *personal*, when it denotes a personal obligation, as liability on a bond or contract.

BURDEN, HENRY (1791-1871). An American inventor and manufacturer. He was born in Scotland, studied science and engineering in Edinburgh, and came to the United States in 1819. The next year he invented and patented the first cultivator used in agriculture in this country. His inventions include improvements in plows; a machine for making iron railroad-track spikes and one for making horseshoes, which produced 60 shoes per minute from the bar. He was for many years proprietor of the Troy Iron and Nail Works, one of the largest manufactories in the world.

BURDEN OF PROOF, or *ONUS PROBANDI*. This term has two significations in the law of evidence. First, it means the obligation resting upon the party having the affirmative of the issue in a litigation to prove his case. In this sense the burden of proof is generally upon the plaintiff. If, however, the defendant sets up an affirmative defense, the burden is upon him. An example of such a defense is afforded when an insurance company, sued upon a marine insurance policy, sets up as its only defense the unseaworthiness of the insured ship. In such a case the defendant has the burden of proving that the ship was unseaworthy. Second, the term means the obligation to give evidence at some particular stage of the trial. For example, if the party having the affirmative of the issue has given evidence enough to entitle him to a judgment, the burden of giving further evidence rests upon his opponent. When the term is used in this sense, it is proper to say that the burden of proof shifts from one party to the other during the trial. When used in the first sense, it is incorrect to say that the burden of proof shifts. The burden of making out his case is always upon him who has the affirmative of the issue. Hence, in a criminal case, it is always upon the government, which is also bound to make out its case, i.e., to establish the guilt of the prisoner beyond a reasonable doubt. In civil cases the one having the affirmative of the issue makes out his case if he convinces the jury that the preponderance of proof is on his side. Consult Thayer, *Preliminary Treatise on Evidence at the Common Law* (Boston, 1898). See EVIDENCE: PROOF.

BURDETT, SIR FRANCIS (1770-1844). An English liberal politician. He was born Jan. 25, 1770, and was educated at Westminster and Oxford. He spent some years on the Continent and was a witness to the progress of the first French Revolution. In 1793 he married Sophia Coutts, heiress of the wealthy London banker; in 1796 was elected member of Parliament for Boroughbridge, Yorkshire, and in 1797 succeeded to the baronetcy. He made himself conspicuous by his opposition to the government and the French War; advocated parliamentary

reform, Catholic emancipation, and other liberal measures, and, as an effective political speaker, for many years was the idol of the London populace. Having obtained a parliamentary inquiry into the abuses of the metropolitan prisons, he was returned in 1807 for Westminster, which he represented for nearly 30 years. Burdett, in 1810, published, in Cobbett's *Political Register*, a letter to his constituents, declaring the conduct of the Commons illegal in imprisoning John Gale Jones, a radical orator, who had questioned their authority in excluding strangers from the House. The Speaker issued a warrant for Burdett's arrest as guilty of a breach of privilege. Refusing to surrender, he for two days barricaded his house, the populace supporting him in his resistance; but on April 9 the sergeant at arms, aided by the police, obtained an entrance and conveyed him to the Tower. The prorogation of Parliament restored him to liberty. Prosecuted in 1819 for a letter on the "Peterloo massacre," strongly condemning the authorities, he was sentenced to three months' imprisonment and a fine of £2000. In 1835 he joined the Conservatives and in 1837 was returned for Wiltshire, which he represented till his death, Jan. 23, 1844.

BURDETT-COUTTS, bûr-dët' kôôts', ANGELA GEORGINA, BARONESS (1814-1906). An English philanthropist, daughter of Sir Francis Burdett. In 1837 she inherited much of the property of her grandfather, Thomas Coutts, the banker. Besides spending large sums in building and endowing churches and schools, she endowed the three colonial bishoprics of Cape Town, Adelaide, and British Columbia, at an outlay of about £50,000, and founded an establishment in South Australia for the improvement of the aborigines. She effected important reforms in the teaching of girls at the national schools and established a shelter and reformatory for fallen women. In 1893 she edited *Woman's Mission*. To the city of London she presented, besides several handsome fountains, the Columbia Market, Bethnal Green. She also built Columbia Square, consisting of model dwellings at low rents. In 1871 she accepted a peerage from the government. In 1872 the freedom of the city of London was conferred upon her (the first woman who ever received it) and in 1874 the freedom of Edinburgh. She was married in 1881 to W. L. Ashmead-Bartlett, who by royal license used the surname Burdett-Coutts. She was buried in Westminster Abbey.

BURDETT-COUTTS, WILLIAM LEHMAN ASHMEAD-BARTLETT (1851-1921). An English philanthropist, son of Ellis Bartlett, of Plymouth, Massachusetts. He was educated at Keble College, Oxford, and in 1881 married the Baroness Burdett-Coutts, whose name he assumed. In the interest of the Turkish Compassionate Fund originated by the Baroness he went to the scene of the Russo-Turkish War in 1877. Subsequently he investigated the problem of the food supply of the London poor, reopened the Columbia Market for the sale of fish and vegetables, visited Ireland in 1879-80 to organize relief for the famine districts, and aided in the Baroness's scheme for helping the Irish fishermen. He promoted several parliamentary acts, including the Hampstead Heath Act of 1885. His visit to South Africa in 1900 resulted in a reform of the Army Medical Service. In 1902 he turned his attention to railway reform, and his efforts resulted in the Railway Bill of 1910.

He is author of a volume on the Russo-Turkish War.

BURDETTE, ROBERT JONES (1844-1914). An American humorist and clergyman, who became famous through his paragraphs in the *Burlington* (Iowa) *Hawkeye*. He was born in Greensboro, Pa., and received a secondary school education in Peoria, Ill. During the Civil War he served as a private soldier. In 1869 he became night editor of the *Peoria Daily Transcript* and afterward was associated with other papers. He joined the staff of the *Burlington Hawkeye* in 1872, and his humorous paragraphs soon began to be quoted in newspapers throughout the country, with the result that, beginning in 1876, he made a number of very successful lecture tours. He became a licensed minister of the Baptist church in 1887, and took charge of the Temple Baptist Church at Los Angeles, Cal., in 1903, and was made its pastor emeritus in 1909. His books include: *The Rise and Fall of the Mustache and Other Hawkeyetems* (1877); *Hawkeyes* (1880); *Life of William Penn* (1882); *Innach Gerden and Other Comic Sketches* (1886); *Chimes from a Jester's Bells* (1897); *Old Time and Young Tom* (1912).

BURDICK, FRANCIS MARION (1845-1920). An American professor of law. He was born at De Ruyter, N. Y., graduated at Hamilton College in 1869, and in 1872 at Hamilton College Law School, and from 1872 to 1883 practiced law. He was mayor of Utica, N. Y., from 1882 to 1883, professor of law and history in Hamilton College from 1882 to 1887, and professor of law in the law school of Cornell University from 1887 to 1891. In 1891 he was appointed professor of law in Columbia University. He became commissioner on uniform State laws for New York (1907). Besides contributing extensively to legal periodicals he published: *Cases on Torts* (1895); *The Law of Sales* (3d ed., 1913); *Cases on Sales* (2d ed., 1901); *The Law of Torts* (1905; 2d ed., 1908); *Law of Partnership* (2d ed., 1906); *The Essentials of Business Law* (1908).

BURDIGALA. See BORDEAUX.

BURDOCK (*bur*, the globular seed case + *dock*, the plant; see DOCK) (*Arctium*). A genus of plants of the family Compositæ. The heads of flowers are globose, or nearly so, and each of the scales of the involucre runs out into a long, rigid prickle, which is hooked at the point. By means of these hooks the flower head—popularly called a bur—readily lays hold of the clothes of a passer-by, the wool of a sheep, or the like, and thus the seeds are transported from one place to another. The common burdock (*Arctium lappa*) is abundant in waste and bushy places, by waysides, etc., in Europe, and is naturalized in the United States. Its root is biennial, large, and fleshy, somewhat carrot-shaped; the root leaves large, stalked, heart-shaped; the stem stiff, upright, somewhat branched and leafy, 3 feet or more high. The root, as well as other parts of the plant, is sometimes used in medicine, being diaphoretic and diuretic and acting upon the cutaneous system and the kidneys. It is capable of being made a substitute for sarsaparilla. In autumn young roots are often found to contain as much as 45 per cent dry weight of inulin. In many countries the roots, young shoots, and young leaves of burdock are used in soups, and the plant is cultivated for this use in Japan. The roots are said to resemble artichokes in taste.

The leaves and their expressed juice are sometimes applied to burns and suppurations. See Plate of BONESER, ETC.

BURDON-SANDERSON, SIR JOHN SCOTT (1828-1905). British physician. He was professor of physiology, University College, London, 1874-82; professor of physiology, Oxford University, 1882-95; Regius professor of medicine, Oxford, 1895-1904, when he resigned and was succeeded by Dr. Osler. He aroused much sentimental opposition because he upheld the necessity of experiments on animals. His writings were chiefly on cholera, cattle plague, and tuberculosis. He did much research work in investigating nerve and muscular tissue. In 1893 he was president of the British Medical Association, and in 1881 he was Baly medalist of the Royal College of Physicians, London. He delivered the Croonian Lectures to the Royal Society in 1867, 1877, and 1899. Consult *Sir John Burdon-Sanderson*, a memoir written by his wife and completed and edited by his nephew and niece (Oxford, 1911). This volume contains, also, selections from his papers and addresses.

BURDWAN, bū-dwān'. See BARDWAN.

BURE. See BUR.

BUREAU (Fr., from OF. *burel*, coarse woolen cloth, because a bureau was originally covered with brown baize). A writing table or desk with drawers. The use of the French word in this sense is at least as old as Swift, and became common in England in the latter half of the eighteenth century. In America it is used to signify any chest of drawers. The word is also applied to an office for transacting business, and hence to a department of public administration. Bureaucracy is by extension a government by officeholders characterized by adherence to official traditions and "red tape." For the history of the article of furniture, consult Viollet-le-Duc, *Dictionnaire raisonné du mobilier français* (Paris, 1858-75).

BUREL, or **BORREL**, or **BUREAU** (OF. *burel*, a coarse cloth, russet-colored, from Lat. *burrus*, dark red, LL. *burra*, coarse red cloth). A woolen cloth, generally of coarse texture, manufactured in England in the Middle Ages for cloaks and other outer garments.

BURETTE, bū-rët' (Fr., little vase, from OF. *buire*, flask, from Lat. *bibere*, to drink). A measuring apparatus invented by Gay-Lussac and much used in chemical laboratories. It consists of a graduated glass tube terminating in a narrow opening. By means of an attachment, as a stopcock or rubber tube with a spring clamp, a liquid contained in a burette may be drawn off by drops. The burette is usually employed when it is necessary, for analytical purposes, to use precisely measured volumes of liquid reagents.

BURG. See BOROUGH; BURGH.

BURG, būrk (Ger., fort—it is a walled town). A town of Prussia, in the Province of Saxony, situated on the Ihle, about 13 miles northeast of Magdeburg (Map: Prussia, D 2). It has long been famous for its extensive woolen and shoe manufactures. It has also manufactures of gloves, starch, and tobacco, dye works, tanneries, brick kilns, distilleries, and foundries, and a large trade in farm produce. The prosperity of Burg dates from the end of the seventeenth century, when a large number of French, Palatinate, and Walloon refugees took shelter there. Pop., 1890, 17,500; 1900, 22,500; 1910, 24,074.

BUR'GAGE TENURE (from OF. *bourgaze*, ML. *burgazium*, from *burgus*, borough). A form of tenure of real property which prevails both in England and Scotland, although somewhat differently regarded in these two countries. In England it is a variety of socage (q.v.) tenure and obtains where the king or other person is lord of an ancient borough in which the tenements are held by a certain and determinate rent. Burgage tenures are characterized by a variety of curious customs, affecting the alienation and inheritance of the lands so held and differentiating them from the more usual common-law tenures. Such, for example, is the custom that the wife shall be endowed with all her husband's tenements and not with the third part only, as at common law.

In Scotland, by this tenure is meant a peculiar sort of military holding affecting property in royal burghs, the sovereign being superior or overlord, and each individual proprietor or burgess holding direct of the crown, for the *reddendo*, or service, of *watching* and *warding*. This service is now merely nominal. If the burgh, as such, ceases to exist, the crown does not thereby lose its rights over the proprietors, for they continue as crown vassals (q.v.). The statutes 31 and 32 Vict. chap. 101 and 32 and 33 Vict. c. 116 abolished many useless forms of this tenure. (See **TENURE**.) Consult: Blackstone, *Commentaries on the Laws of England*; Pollock and Maitland, *History of English Law* (2d ed., Boston, 1899); Stephen, *New Commentaries on the Laws of England*.

BURGAS, böör-gäs', or **BOURGAS**. A seaport town of Bulgaria and capital of the Department of Burgas, situated on the bay of the same name, an inlet of the Black Sea, about 76 miles northeast of Adrianople (Map: Turkey in Europe, F 3). Burgas is the terminal of the Sofia-Burgas Railway and contains several mosques and Christian churches. It carries on active trade in grain, wool, cheese, butter, and attar of roses. Pop., 1901, 11,700; 1905, 12,946, chiefly Bulgarians.

BURGDÖRF, böörk'dörf (Fr. *Berthoud*, in local patois *Burtlef*, founded by Berthold V). A town in the Swiss Canton of Bern, situated on the Emme, 14 miles from Bern. It is over 1800 feet above sea level and consists of a lower and an upper part, which are connected by spiral streets (Map: Switzerland, B 1). There is an ancient castle in which Pestalozzi had his school for a number of years. The town contains also ribbon, linen, wool, tobacco, and chocolate manufactures, and carries on a large trade in dairy products. Pop., 1900, 8400; 1910, 9381.

BURGEON ISLANDS. A group of small islands off the south coast of Newfoundland, in lat. 47° 33' N. and long. 57° 44' W. (Map: Newfoundland, C 5). The scenery is very picturesque, and Burgeo, the chief village, is a favorite resort for artists. The islands are valuable fishing stations. Here, in 1765, Captain Cook made an observation of an eclipse of the sun.

BÜRGER, bur'gër, GOTTFRIED AUGUST (1747-94). A German poet. He was born in Molmerswende, the son of a country clergyman, and studied theology at Halle and law at Göttingen, where his poetic genius was fired by the works of Shakespeare and by Percy's *Reliques*. He was closely associated with the Göttingen Poetical Society (*Dichterbund*), contributed to its organ, the *Musenalmannach*, and from 1778 until

his death was its editor. The University of Göttingen gave him an honorary degree in 1787 and soon after made him assistant professor (without salary) of philosophy and aesthetics, a curious post for one of dissolute youth and discreditable manhood. The greatest work of his misguided genius was produced while he was still young. His best ballad, *Lenore* (1774), coincided in date with Goethe's *Götz von Berlichingen*, and the beginning of the decade of literary storm and stress. Goethe, who was soon to speak of him as a "sad example," thought his earlier poems "worthy of a better age." Critics to-day see in them the most potent influence towards the revival of the ballad form in which so much of the best German poetry of the next generation was cast. These ballads are classics familiar to every German schoolboy. Some of the most striking, besides the incomparable *Lenore*, are *Der wilde Jäger*, *Das Lied vom braven Mann*, *Die Weiber von Weinsberg*, *Der Kaiser und der Abt*, and Bürger's own favorite *Lenardo und Blandine*. Bürger also revived the sonnet form in German, and his experiments in it were praised as models by Schiller, who, however, severely criticised some of Bürger's more popular poems. His ballads have retained their popularity to this day, and his poems have appeared in many editions. His collected works were edited by his friend Reinard (4 vols., 1796). He was introduced to English readers in *Der wilde Jäger* and *Lenore* by Walter Scott in his *The Chase* and *William and Helen*, two ballads from the *German of G. A. Bürger* (Edinburgh and London, 1796). The elder Dumas translated *Lenore* into French. Bürger's imagination was fresh and naïve, but it was not rich or sustained. His taste was more elegant than delicate; his style was studied, though clear and forcible. The moral tone of most of his poems, virile and almost uniformly noble, contrasts strangely with that of his life. His qualities were those which command popular favor, and his defects those which the majority of readers readily condone. His place in German letters is apparently secure. The most complete edition of Bürger's poems is *Gedichte von Gottfried August Bürger* (Hg. von A. Sauer, Berlin u. Stuttgart, 1884). Consult H. Pröhle, *G. A. Bürger, Sein Leben und Seine Dichtungen 1856*. For additions and corrections consult Herrig's *Archiv*, vol. xxi, pp. 160-179.

BURGER, böör'gër, JOHANNES (1829-1912). A Swiss line engraver. He was born at Burg, Canton Aargau, and studied under Suter at Zofingen and Thäter in the Munich Academy. After 1859 he resided in Munich, but before settling down he spent three years in Florence, Dresden, and Rome, studying the old masters, many of whose works he has reproduced. His masterpiece is the "Madonna of the Chair" after Raphael. Among other important engravings are "Aurora" after Guido Reni, "The Vestal" after Angelica Kauffman, three pictures from the Life of St. Boniface after the paintings by H. Hess in the Munich Basilica, and "Christ and the Children" after Martin Feuerstein.

BURGER, LUDWIG (1825-84). A German painter and illustrator. He was born in Warsaw, Poland, studied at the Academy in Berlin and for a time under Couture in Paris. After 1853 he lived in Berlin, where he gained fame as an illustrator and was appointed professor in the Academy. He took part in the Schleswig-Holstein War and the War of 1866; and his

drawings for Theodore Fontane's history of these two wars (published in 1866 and 1870-71) and for Ludwig Schmidt's *Preussens Geschichte en Wort und Bild*, are among the best of his works. His prolific artistic activity included interior decorations for the city hall of Berlin and elsewhere, stained glasses for the cathedral of Cologne, initials, vignettes, etc.

BURGERS, *bōōr'gērs*, THOMAS FRANÇOIS (1834-81). A President of the former Transvaal Republic. He was born in Cape Colony, of an old Dutch family, was educated at the University of Utrecht, Holland, and became a minister of the Dutch Reformed church at Hanover, Cape Colony. He was an eloquent preacher, but his rationalistic views brought upon him a trial for heresy, in which, however, he was acquitted. In 1872 he was elected President of the Transvaal Republic by the Liberals, succeeding Pretorius, and continued in office until the annexation of the republic by the British in 1877. His presidential policy was characterized by brilliant but impracticable schemes, aiming chiefly at territorial expansion.

BURGESS, *būr'jēs*, TRISTAM (1770-1853). An American politician. He was born in Rochester, Mass., and in 1796 graduated at Brown University. He became one of the leaders of the Federal party, was Chief Justice of Rhode Island, and from 1815 to 1825 was a professor in Brown University. He then served in Congress from 1825 to 1835, where he favored a protective tariff and attracted attention by his brilliant replies to the abuse heaped upon New England by John Randolph. Consult Bowen, *Memoirs of Tristram Burges* (Providence, 1835).

BUR/GESS (OF *burgēis*, Fr. *bourgeois*, ML. *burgensis*, from *burgh*, town, borough). A citizen or freeholder in a municipality; one entitled to full rights of citizenship from his position as a householder or tradesman, and duly enrolled as such on what is known as the "free-man's roll." The word in time came to mean, in some places, chief magistrate of a community, and it is still used in that sense to-day in the towns of Connecticut and Pennsylvania, where the borough is a distinct political division. The first American representative legislative body was the "House of Burgesses" of Virginia, which was called together by the Governor of the Colony in 1619. It consisted of two delegates from each of the 11 settlements embraced in his jurisdiction. The name was continued until about the time of the Revolution, as also in Maryland. The word has also been used in England to denote a member of Parliament returned from a borough, in contradistinction to a shire or county member. See **BOROUGH**.

BURGESS, ALBERT FRANKLIN (1873-). An American entomologist. He was born at Rockland, Mass., and attended the Massachusetts Agricultural College. From 1895 to 1899 he served on the Board of Agriculture of his native State, for a short time was assistant in entomology at the University of Illinois, and in 1902-07 was chief inspector of nurseries and orchards for the Ohio Department of Agriculture. In 1907 he took up work in the United States Bureau of Entomology, publishing a number of reports, bulletins, and articles. He identified himself prominently with various scientific societies.

BURGESS, ALEXANDER (1819-1901). An American Protestant Episcopal divine. He was born in Providence, R. I., and graduated at

Brown University (1838) and at the General Theological Seminary, New York (1841). He held rectorates in Augusta, Me., from 1843 to 1854; Portland, Me., from 1854 to 1867; Brooklyn, N. Y., from 1867 to 1869; and Springfield, Mass., from 1869 to 1878. Upon the formation of the diocese of Quincy, Ill., he was consecrated as its first bishop, May 15, 1878. He also served as a deputy of the General Convention of the Episcopal Church from 1844 to 1877, representing the dioceses of Maine, Long Island, and Massachusetts. He wrote *Questions for Bible Classes and Sunday Schools* (1855).

BURGESS, CHARLES FREDERICK (1873-). An American chemical engineer, born at Oshkosh, Wis. After graduating from the University of Wisconsin he was instructor and assistant professor of electrical engineering from 1895 to 1900 at the same institution. In the latter year as professor he organized the department of applied electrochemistry and chemical engineering. Besides developing several electrolytic processes he became investigator of electrolytic iron alloys for the Carnegie Institution in 1904, and also president of the Northern Chemical Engineering Laboratories. He published *The Strength of the Alloys of Nickel and Copper with Electrolytic Iron* (1910).

BURGESS, EDWARD (1848-91). An American yacht designer, born in West Sandwich, Mass. He was educated at Harvard, graduating in 1871, and became secretary of the Boston Society of Natural History, in which capacity he edited the publications of the society. In 1879 he became instructor in entomology at Harvard, remaining until 1883. Financial reverses caused him to turn his attention to designing yachts. From his designs the *Puritan* was built, which easily defeated the *Genesta* (English) in the races for the *America's* cup in 1885. In 1886 his *Mayflower* led in the race with the English *Galatea*. In 1888 his fishing schooner *Carrie E. Phillips* distanced four competitors in the fisherman's race held in Boston harbor. His *Volunteer* won the *America's* cup against the *Thistle*, the special product of British genius, in the international races of 1887. His other yachts included the *Mariquita*, *Minerva*, and *Gossoon*, all of them remarkably swift-sailing craft.

BURGESS [FRANK] GELETT (1866-). An American humorous author and artist in the grotesque, born in Boston, Mass. He graduated in 1887 at the Massachusetts Institute of Technology, from 1887 to 1890 was a draughtsman on the Southern Pacific Railway, and in 1891-94 was instructor in topographical drawing at the University of California. He was a designer from 1894 to 1895, and then established in San Francisco a fantastic periodical dubbed *The Lark*, which in 1897 expired with an *Epitark*. Afterward he became a familiar contributor to English and American publications. He wrote and illustrated several delightfully whimsical works such as *The Purple Cow* (1897); *Goops and How to Be Them* (1900); *A Gage of Youth* (1901); *The Rubáyát of a Persian Kitten* (1905); *The Cat's Elegy* (1913); and *Love in a Hurry* (1913).

BURGESS, FREDERICK (1853-1925). An American clergyman. He was born in Providence, R. I., and was educated at Brown University, at the General Theological Seminary, New York City, and at Oxford. After his

ordination to the priesthood he was successively in charge of Grace Church, Amherst, Mass., from 1878 to 1883; Christ Church, Pomfret, Conn., from 1883 to 1889; Grace Church, at Bala, Pa., from 1889 to 1896; Christ Church, Detroit, from 1896 to 1898; and Grace Church, Brooklyn, from 1898 to 1902, when he became Bishop of Long Island.

BURGESS, GEORGE (1809-66). First Protestant Episcopal Bishop of Maine. He was born in Providence, R. I., graduated at Brown University in 1826, and afterward studied in Germany. In 1834 he became rector of Christ Church, Hartford, Conn., and in 1847 was chosen Bishop of Maine, officiating also as rector of Christ Church in Gardiner. He went to Hayti to restore his health, but died there. He published: *Pages from the Ecclesiastical History of New England* (1847); *The Last Enemy Conquering and Conquered* (1850); sermons: a metrical version of the Psalms; and a volume of his collected *Poems* (1868). Consult *Memoir*, by his brother, A. Burgess (Philadelphia, 1869).

BURGESS, GEORGE KIMBALL (1874-). An American physicist, born at Newton, Mass. After an education obtained at the Massachusetts Institute of Technology and at the University of Paris, he served as instructor in physics at the former institution and at the universities of Michigan and California. In 1903 he became associate physicist in the National Bureau of Standards, paying particular attention to pyrometric researches. Besides translating *Le Chatelier's High Temperature Measurements* (1901), and *Duhem's Thermodynamics and Chemistry*, he is author of *Recherches sur la constante de gravitation* (1901); *Experimental Physics, Freshman Course* (1902); *The Measurement of High Temperatures*, with H. Le Chatelier (1911; 3d ed. rev., 1912); and *A Micropyrometer* (1913). In addition he became editor of the *Journal of the Washington Academy of Sciences* in 1911.

BURGESS, JAMES (1832-). A Scottish archaeologist, born in Kirkmahoe. He was educated in Glasgow and Edinburgh, went to India in 1855 as professor of mathematics in Calcutta, and in 1873 was appointed director of the archaeological survey of western India. From 1886 to 1889 he was director general of the archaeological surveys of India. He was for some time fellow of the University of Bombay and founded the *Indian Antiquary* (1872). He published numerous valuable works, including: *The Temples of Shatrunjaya* (1869); *The Rock Temples of Elephanta* (1871); *Scenery and Architecture in Gujarat and Rajputana* (1873); *The Cave Temples of India* (with James Fergusson, 1880); *The Ancient Temples and Sculptures of India* (1897-1910); *The Chronology of Modern India from 1494* (1913); *Muhammadian Architecture of Ahmadabad* (2 vols., 1900-05). His writings are also to be found in the *Epigraphia Indica* (of which he was an editor) and in the *Archaeological Reports* (1874-87), on the cave temples of India. He revised and enlarged *Fergusson's Indian Architecture* (2 vols., 1910).

BURGESS, JOHN WILLIAM (1844-). An American educator and writer on history and political science. He was born at Cornersville, Tenn., and studied at Cumberland University, and afterward at Amherst College, Mass., where he graduated in 1867. He then turned his attention to law and was admitted to the Massachusetts bar in 1869, but did not practice, and

for two years was professor of English literature and political economy in Knox College. He subsequently devoted two years to study in Göttingen, Leipzig, and Berlin, and upon his return (1873) became professor of history and political science at Amherst. In 1876 he accepted a similar position in Columbia College. Later his title was changed to professor of political science and constitutional law, and in 1890 he became dean of the faculty of political science; also dean of the faculties of philosophy, pure science, and fine arts. In 1906 he lectured at Berlin as the first occupant of the Roosevelt chair of history, established by Mr. James Speyer. He has published: *Political Science and Comparative Constitutional Law* (1890); *The Middle Period of United States History* (1897); *The Civil War and the Constitution* (2 vols., 1901); *Reconstruction and the Constitution* (1902).

BURGESS, NEIL (1846-1910). An American comedian, born in Boston. Early in his career an accident turned his attention wholly to personating female characters. An elderly actress was taken suddenly ill one evening just before the curtain rose, and Burgess hastily assumed her part. The quaint humor he put into the work produced a sensation, and he decided to make a specialty of female rôles. *Josiah Allen's Wife* was written for him, but his greatest success was doubtless in *Widow Bedott*, in which he first appeared in Providence in 1879, and at Haverly's, New York, the year following. *Vim*, an old play of his under a new name, was produced at the Bijou Opera House, New York, in 1883 and became very popular. In 1889 he produced *The County Fair*, a play that had a successful run of more than two years in New York theatres and has been widely repeated. He was also, in later years, engaged in vaudeville. Consult Clapp and Edgett, *Players of the Present*, Dunlap Soc. Pub. (New York, 1899).

BURGH, bērg, Scot. pron. bŭr'rd, or **BOROUGH** (AS. *burh*, Goth. *bourgs*, Ger. *Burg*, probably from AS. *beorgan*, Goth. *baigran*, Ger. *bergen*, to protect). A term confined chiefly to Scotch towns and cities incorporated in a manner similar to those of English boroughs. There were originally four classes of burghs: royal burghs, burghs of barony, burghs of regality, and free burghs. The first derived their corporate powers from a grant of the crown; the second from that of a baron, temporal or spiritual; the third were originally burghs of barony, but by special royal grant had their powers greatly increased; the fourth, to which class all burghs of our day practically belong, originally asserted their own corporate freedom and were in general free from the great burdens of taxation, etc., common to the other forms of burghs. Consult Dykes, *Scottish Local Government* (Edinburgh, 1907). See **BOROUGH**.

BURGH, HUBERT DE. See **HUBERT DE BURGH**.

BURGHER, bŭrg'ēr, and **ANTI-BURGHER**. In some burghs of Scotland the following oath was exacted of all who would become burgesses: "Here I protest before God and your lordships, that I profess, and allow with all my heart, the true religion presently professed within this realm, and authorized by the laws thereof; I shall abide thereat, and defend the same to my life's end; renouncing the Roman religion called papistry." In 1747 the Synod of the Secession Church of Scotland divided upon the construction to be put upon the words, "The true religion

presently professed." Some held that they referred to the Established church of Scotland, which they all considered so corrupt that they had separated from her; consequently to take the oath was tantamount to pledging themselves to support what they could not in conscience support; accordingly these persons refused to take this oath. They formed the General Associate Synod, but were popularly called the Antiburghers. The others held that the words meant no more than the Protestant religion. These formed the Associate Synod and were popularly called the Burghers. Both bodies still further disintegrated. In 1799 the Constitutional Associate Presbytery was formed out of the Antiburghers, and its adherents were called the Old Light Antiburghers; in 1806 the Original Burgher Presbytery was made out of the Burghers, and its adherents called Old Light Burghers. Those who opposed each party were called New Lights.

BURGKMAIR, or **BURCKMAIR**, böörk'-mür, HANS (1473-1531). A German painter and wood engraver. He was born in Augsburg, the son of a painter, Thoman Burgkmair, from whom he received his earliest instruction. He studied principally under Martin Schongauer in Colmar (Alsace). His earliest paintings are the portraits of Gailer von Kaisersberg (1490, Schleirsheim) and of Martin Schongauer (Munich). In 1501 he received a commission for three pictures of Roman basilicas, with appropriate scenes from the lives of their patron saints, etc. (Augsburg Gallery), which in their harmonious coloring and feeling for the dignity of the human form already remind one of Italy. After 1505 the influence of the Italian masters, especially the Venetian, is greatly accentuated. Indeed, Burgkmair's chief historical significance consists in his having been one of the first to introduce the forms and artistic principles of the Renaissance into Germany. He was a friend of Dürer and the younger Holbein, with both of whom he has much in common, but preserved marked individuality both in his paintings and woodcuts. His work shows steadily increasing power and delicacy of perception for beauty, color, and form. Among the best are the "Nuremberg Madonna" (1509), the "Holy Family" (1511, Berlin Gallery), "St. John in Patmos" (1518, Munich), the altarpiece of the "Crucifixion" (1519, Augsburg), "Marriage of St. Catharine" (1520, Hanover), and the portrait of himself and his wife (1529, Vienna), the last and most perfect of his paintings. The landscapes of many of his religious paintings are elaborate and charming. Among his most celebrated woodcuts are 57 designs for the series "Triumphs of Emperor Maximilian I" (1516-18), the most finished examples of his work; a series of 92 genealogical cuts for the Emperor (1510), in which he developed a new style of wood engraving; another of 110 cuts, called the "Wise King" and representing the deeds of Maximilian. Consult Woltmann in Doehme's *Kunst und Künstler*, vol. i; Dornhöfer, *Ueber Burgkmair und Dürer* (1903).

BURGLAR ALARM. See **ALARM**.

BURGLARY (from Anglo-Fr. *bourg*, OF. *borg*, borough + *laire*, Lat. *latro*, robber)... A common-law offense, defined by Coke to be the breaking and entering by night into the mansion house (i.e., modern parlance, dwelling house) of another with intent to commit a felony therein. Every essential word of this definition contains

an element that is necessary to the completion of the crime. 1. There must be a *breaking*, actual or constructive. But the term "breaking" does not necessarily imply violence; thus, the lifting of a latch, or undoing of a window fastening, or even the compelling by threats of violence of the unlocking of a door from the inside, constitutes a breaking. It has been said that it is a burglarious breaking to come down a chimney because it is "as much closed as the nature of things will permit," for the essence of crime consists in violating the security of a dwelling. To enter an open door or window or to climb through an aperture already made is not a breaking. 2. The *entering* need not be of the whole person; the insertion of the hand, or even of an instrument or tool, for the purpose of completing the felony is sufficient to bring the offense under the head of burglary. Thus, where a man breaks a window and inserts a cane or hook to draw out goods, the offense is common-law burglary, the other elements being present. The entering need not take place immediately after the breaking in order to be burglarious, but it must be connected with it as part of the criminal intent, as where a man breaks a window open on one night and, returning the night after, completes the crime. 3. The building entered must be a *dwelling house*, or a part thereof, in actual use as a residence, and to which the person accused has no legal right of entrance. For the purpose of the definition any outhouse properly appurtenant to the dwelling and within a common inclosure or curtilage is part thereof. This would not include, however, a distant barn or disconnected storehouse, or the like. Apartments under the same roof used for residence, and entered through separate outside doors, form separate dwelling houses in the legal sense; so, also, do suites of rooms in a college or lodging house where the actual owner does not reside. By English courts a church was held subject to burglary as being "the dwelling house of God." 4. The breaking and entry must be *in the night time*. This is considered to include the time between the disappearance of daylight and its reappearance in the morning; daylight is further defined as existing when a man's face can be distinguished thereby; the existence or absence of moonlight has no effect in the consideration of this point, as "the malignity of the offense does not so properly arise from its being done in the dark as at the dead of night." 5. There must be *intent to commit a felony*. It is immaterial whether the intended felony be larceny, arson, rape, or murder; but in the last three cases, as the offense is greater than that of burglary alone, the prosecution would naturally be for the most serious crime, or its attempt. If no felonious intent exists, the breaking and entering in the night amount only to trespass.

The common-law definition of burglary has been changed by statute in many States of the United States. The extension of the definition of the crime in some States covers the breaking and entry in the daytime as well as the night, and of shops, factories, warehouses, etc., as well as of dwelling houses. In a few of these States burglary has been extended to cover practically the breaking and entry of any building at any time with intent to commit any crime. The punishment for burglary under the English law extended even to penal servitude for life; in this country imprisonment for 20 years is probably

the maximum punishment. The killing of a burglar, in defense of self, family, or property, is justifiable homicide (q.v.). The practice of insuring against burglary is now common, both in England and in this country. (See *INSURANCE*.) Consult the authorities referred to under *CRIMINAL LAW*.

BÜRGLEN, bŭrk'lən (Ger. *Bürglein*, dim. of *Burg*, fort, town). A village of Switzerland, in the Canton of Uri, 1800 feet above sea level and about 2 miles from Altorf (Map: Switzerland, C 2). It is the reputed birthplace of William Tell and has a celebrated chapel. Pop., 1900, 1700; 1910, 1822.

BURGMÜLLER, bŏrk'mŭl'ĭēr, NOBERT (1808-36). A German composer, born in Düssel-dorf. He was a pupil in Cassel of Spohr and Hauptmann and was much esteemed by Schumann, who (*Gesammelte Schriften*, vol. iii, p. 145) refers in high terms to his ability. His compositions, which give evidence of great imaginative and inventive power, include portions of two symphonies, of which one was finished by Schumann, an overture, and a piano-forte concerto. These, with some other music, were collected and published in Leipzig.

BUR'GOMASTER. A sailor's name for certain large gulls, as the glaucous gull of Greenland (*Larus hyperboreus*, or *glaucus*).

BUR'GOMASTER, or **BÜRGERMEISTER**, bŭr'gēr-mī'stēr. The title of the chief magistrate of a city or town in Germany, analogous to the French *maire*, the English *mayor*, and the Scottish *provost*. The office is now elective, but in most parts of Germany the government reserves the right to confirm or reject the selection of the people.

BUR'GON, JOHN WILLIAM (1813-88). An English clergyman and scholar, born in Smyrna, Asia Minor. He studied at Worcester College, Oxford, took orders in 1848, and in 1863 was appointed vicar of the church of St. Mary the Virgin at Oxford. In 1876 he became dean of Chichester. From the long list of his works the following may be cited: *Oxford Reformers* (1854); *A Plain Commentary on the Four Holy Gospels* (1855; new ed., 4 vols., 1877); *Plain Commentary on the Book of Psalms* (2 vols., 1857); *Inspiration and Interpretation* (1861); *The Athanasian Creed* (1872); *The Revision Revised* (1884); and *Twelve Good Men* (1888). For his life, consult Goulburn (London, 1892).

BUR'GOO (origin unknown). A name used in some parts of the United States for barbecue (q.v.) and for a savory stew sometimes served on such occasions. The reader is referred also to Norton's *Political Americanisms* (London, 1890).

BURGOS, bŏr'gŏs (Sp. pl. of *burgo*, Ger. *Burg*, fort, castle; cf. the city's Iberian name *Briga*, hill, fort). A city of Spain and capital of the province of the same name, situated in a fertile valley at the foot of the Sierra de Oca, on the right bank of the river Arlanzón (Map: Spain, D 1). Burgos has an old quarter with narrow, crooked streets, and a quarter with fine buildings and broad promenades. The castle and walls are in ruins. The cathedral, founded in 1221, is the most elaborate Gothic structure in Spain. The city possesses numerous monuments and relics of old Spain, of the time of the Cid. The industries include woolen-cloth weaving, hat making, etc. Burgos is the great wool mart of Old Castile and also exports considerable grain.

Pop., 1910, 31,489. Burgos was founded about the close of the ninth century as the capital city of the Counts of Castile and León and soon became a flourishing city, reaching the height of its prosperity in the fifteenth century, when it shared with Toledo the prestige of being occupied as a royal residence. It declined rapidly after the removal of the court to Madrid in 1560. To-day, despite its decay, the city is dominated by the grand old cathedral and the personality of the national hero, the Cid Campeador. Consult: Wilson, "Burgos Cathedral," in *The Churchman*, vol. lxxxii (New York, 1900); G. E. Street, *Gothic Architecture in Spain* (London, 1869); R. Amador de los Ríos, *Burgos*, in the series entitled "España" (Barcelona, 1888); A. Ilacayo y Santa María, *Burgos, etc.* (Burgos, 1889); J. B. Waring, *Architectural, Sculptural, and Picturesque Studies in Burgos and its Neighborhood*, which is an important set of architectural drawings in folio (London, 1852); P. Orcajo, *Historia de la Catedral de Burgos, etc.* (Burgos, 1856); E. de Oliver-Copons, *El Castillo de Burgos* (Barcelona, 1893); F. Tarín y Juaneda, *La Real Cartuja de Miraflores* (Burgos, 1896). For the history of the city, consult V. Balaguér, *En Burgos* (Burgos, 1895); A. Salvá, *Cosas de la vieja Burgos and Burgos en las comunidades de Castilla* (Burgos, 1892 and 1895, respectively); and Calvert, *León, Burgos, and Salamanca*; a historical and descriptive account (London, 1908). Much of the history of Burgos still lies inedited in rare and costly manuscripts. That Burgos has produced its fair share of writers was amply demonstrated by Manuel Martínez Añibarro y Rives, *Intento de un diccionario biográfico y bibliográfico de autores de la provincia de Burgos* (Madrid, 1889).

BURGOYNE, bŭr'goin', JOHN (1722-92). An English general in the American Revolutionary War, also known as a successful dramatist. He was reputed to be a natural son of Lord Bingley, but his father was Capt. John Burgoyne, son of Sir John Burgoyne of Bedfordshire. He was educated at Westminster, where he made friends with Lord Strange, eldest son of the Earl of Derby, and presently eloped with his sister, Lady Charlotte Stanley, and married her in 1743. He had early entered the army, but soon after his marriage he sold his commission to pay his debts. He now lived abroad for seven years, but entered the army again in 1758 as captain of the Foot Guards. In 1759, as lieutenant colonel of the Coldstream Guards, he served at Belle-Isle. On his initiative light cavalry was introduced in the British army the same year. He was elected member of Parliament and gave evidence of statesmanship in criticising the colonial administration. In 1762 he commanded a force sent into Portugal for the defense of that kingdom against the Spaniards, where he surprised and captured Alcántara. In 1775-76 he served in North America and then returned to England. He landed in America again early in 1777, having been placed in command of a powerful expedition with orders to penetrate from Canada into New York State, march south along the valley of the Hudson, and join Howe's forces, so as to divide the American Confederacy in twain. Including a body of several hundred Indians, the total force at his command when he set out was not far from 10,000 men. He captured Ticonderoga on July 6, but failed to preserve his communications with Canada in

the face of an ever-watchful foe. On August 16 a detachment of his army was almost annihilated at Bennington by Stark. A severe engagement with General Gates at Stillwater, on September 19, resulted unfavorably for the British. Burgoyne now found himself beset. He fought a second battle at Stillwater (battle of Saratoga) on October 7 and suffered a decisive defeat. On October 17 he surrendered to Gates with between 5000 and 6000 men. The success of the Americans in this campaign was due in great measure to Schuyler. Washington allowed Burgoyne to return to England, where, denied audience of the King and refused a court-martial, he went over to the Opposition party and resigned his appointments; but on a change of ministry at the close of the American War he was appointed commander in chief in Ireland. He retired with his political friends two years after and devoted his time to literature. His wife died in 1776. He had several natural children by Susan Caulfield, an opera singer. One of these was Field Marshal Sir J. F. Burgoyne. His writings include: *State of the Expedition from Canada* (1780; new ed., 1865), a vindication of his campaign: satires against Pitt's administration (in the *Westminster Guide*, 1783); and stage works, *The Maid of the Oaks*, *The Lord of the Manor* (comic opera libretto, 1780), and *The Heiress* (1786), a successful work subsequently translated into several languages. His last political appearance was as a manager of the impeachment of Warren Hastings in 1787. He died suddenly, Jan. 3, 1792, and was buried in Westminster Abbey. Consult: De Fonblanque, *Episodes from the Life and Correspondence of Burgoyne* (London, 1876); O'Callaghan, ed., *Orderly Book of Lieutenant General John Burgoyne* (Albany, 1860); and Stone, *Campaign of Lieutenant General Burgoyne* (Albany, 1877).

BURGOYNE, SIR JOHN FOX (1782-1871). An English military engineer, the eldest of four natural children of Gen. John Burgoyne. He was educated at Eton and the Royal Military Academy at Woolwich and entered the Royal Engineers in 1798. From 1800 to 1807 he served in the Mediterranean; was with Moore at Corunna in 1809 and served under Sir Arthur Wellesley in the Peninsula until 1814. In 1814 he was commanding engineer of the expedition to New Orleans. In the Crimean War he was chief of the engineering department of the British army until recalled in 1855. For his services at Sebastopol he was made by the Sultan a member of the Order of the Medjidieh and by the French Emperor a grand officer of the Legion of Honor. He became general in 1855, was created a baronet in 1856, and in 1868 was made a field marshal. Many of his writings were republished in *Military Opinions of General Sir J. F. Burgoyne* (1859). For his *Life and Correspondence*, consult Wrottesley (London, 1873).

BURGRASS, or SANDBUR (*Cenchrus*). A genus of about 20 species of grasses, distributed throughout warm temperate and tropical countries. The common burgrass (*Cenchrus tribuloides*) is an annual grass, frequent in sandy soils along river banks. The fertile spikelet is surrounded by several sterile spikelets which develop sharp, rigid awns. Injuries from these are painful to man or animal and frequently cause trouble with sheep, their wool becoming matted with them. It is one of the worst weeds wherever it becomes abundant. The stems are

prostrate, 1 to 2 feet long, and the spikes are composed of 10 to 20 spiny burs. Wherever this pest appears every effort should be expended to eradicate it. A second species, *Cenchrus echinatus*, occurs in the Southern States, where it is known as cockspur. It is a stouter plant than the common burgrass and is just as troublesome.

BUR'GRAVE, or BURG'GRAVE (OHG. *burggrāvo*; cf. Ger. *Burg*, town + *Graf*, count, governor). In the Middle Ages, an Imperial lieutenant in command of a castle or burg. The burgrave was an important factor in the development of towns and he held the rights of judiciary, surveillance, and police. Occasionally the jurisdiction of the burgrave extended to the country immediately surrounding the stronghold proper. As a rule the office was given to a member of the lower nobility and soon became hereditary. With the growth of power in the cities, however, the dignity was abolished. The burgraves of great commercial centres such as Augsburg, Magdeburg, and Nuremberg possessed extensive powers. In the last city the post was held by the Hohenzollern family.

BURGSTALLER, burk'shtäl'ér, ALOYS (1871-). A German tenor, born at Holzkirchen. He received his musical education from Julius Kniese at the Wagner training school at Bayreuth. In 1894 he sang minor rôles at Bayreuth, and then filled positions at Frankfurt and Hamburg. His real début took place at Bayreuth in 1897, when, at the request of Madame Wagner, he appeared as *Siegfried*, making a deep impression with his beautiful voice, although as an actor he was rather stiff. This defect he gradually overcame, so that he was soon recognized as one of the finest Wagnerian tenors. From 1902 to 1909 he was the principal Wagnerian tenor of the Metropolitan Opera House in New York, where he scored an enormous success as *Parsifal* at the first American production in 1904. After his return to Germany he devoted himself chiefly to "guest" appearances in the principal cities.

BURGUNDIAN CROSS. See SAINT ANDREW'S CROSS.

BURGUNDIANS. A people descended from a tall, blond Teutonic ancestry, who moved into Gaul in the fifth century. The present population of the region they occupied (see BURGUNDY) has largely reverted to the Alpine type and is said to be more French than the Auvergnats. Consult Ripley, *Races of Europe* (New York, 1899).

BUR'GUNDY (Fr. *Bourgogne*). A name applied at different periods during the Middle Ages to a number of kingdoms and principalities which arose in the region of western Switzerland, Savoy, and the valley of the Rhône. The name was derived from the Burgundians, a Germanic tribe whose original home was located between the river Oder and the Vistula, and who in the first decade of the fifth century invaded Gaul. After suffering defeat at the hands of the Romans the tribe had established a kingdom near the Rhine in 413, and later, in 443, had moved to the south. In 476 their dominion embraced the entire valley of the Rhône north of Provence, with their chief strongholds at Geneva, Lyons, and Vienna. They early embraced Christianity. In 534 they were subdued by the Franks. When the Frankish territories, upon the death of Chlothar, were divided among his four sons, the name Burgundy was soon applied to one of

the kingdoms, comprising the country between the Loire, the Alps, the Vosges, and Provence. In the general dismemberment which followed upon the partition of the Frankish Empire at Verdun in 843 a new kingdom arose known as Provence, Arles, or, frequently, Lower Burgundy. It was founded by Boso of Vienne in 879, and later included besides Provence the southern part of Savoy, the region between the Jura and the Saône, and Dauphiné. Count Rudolph established, in 888, the Kingdom of Transjurane Burgundy, which comprehended the northwestern part of Savoy and all that portion of Switzerland lying between the Reuss and the Jura. Those two kingdoms were united in 937 and constituted the new Kingdom of Burgundy, or Arles. The dynasty of Arletan kings became extinct in 1032, when the territory was annexed to the Germanic Empire by Conrad the Salic. Though the formal title was vested in the Emperor, the establishment of his authority over the country proceeded with great difficulty, and for more than 300 years Arles was the subject of continuous dispute between the French and German influence, a conflict which finally terminated in favor of the former.

When the two Burgundies had united in 937 to form the Kingdom of Arles, a small portion on the northwest, with Dijon as its chief town, remained an independent duchy, which came finally under the suzerainty of France. Up to 1361 its rulers were members of the house of Capet. In that year this ducal line became extinct and the duchy reverted to the French crown. In 1363 it was conferred as an appanage upon Philip the Bold, the favorite son of John II of France. Under the energetic descendants of Philip the territories of the duchy were increased, and through marriage alliances and otherwise, Flanders, Artois, Franche-Comté, Namur, Brabant, Limburg, Holland, Hainaut, Zealand, Friesland, and Luxemburg were brought under the rule of the Burgundian dukes. By the middle of the fifteenth century these had come to rank among the most powerful princes of Europe by reason of the extent of territory they controlled and the wealth which they derived from the flourishing cities of the Low Countries; and indeed it seemed not improbable that between the German Empire and France a middle kingdom would arise equal in power to either. Especially dangerous were the dukes of Burgundy to the French kings, their feudal lords, whose territories they threatened from the Vosges Mountains and the Rhine on the east and from Flanders on the north. The antagonism between the dukes of Burgundy and the French kings broke out in fierce wars carried on by Charles the Bold (q.v.), who made himself the champion of feudal rights against the centralizing policy of Louis XI. Triumphant at first in his struggle with France, Charles the Bold met his fate when, carried away by his ambition, he made an attack upon the Swiss of the Jura Mountains. He was defeated in two great battles and slain in the third, the battle of Nancy (1477), and the bulk of his possessions, passing to his daughter Mary, became merged, by her marriage to the Archduke Maximilian, with the possessions of the house of Hapsburg. The Duchy of Burgundy itself, however, did not follow the fortunes of the great Burgundian realm, being immediately seized by Louis XI as a fief of the French crown. (See NETHERLANDS.) In 1512 the Burgundian territories were formed into one

of the ten circles of the Empire. Consult Petit de Vasse, *Histoire des ducs de Bourgogne* (9 vols., Paris, 1885-1905); Barante, *Histoire des ducs de Bourgogne* (13 vols., Paris, 1833-36); Bryce, *Holy Roman Empire*, Appendix (various editions); Putnam, *Charles the Bold* (New York, 1908); Allen, *Burgundy, the Splendid Duchy* (London, 1912); Cartellieri, *Beiträge zur Geschichte der Herzöge von Burgund* (Heidelberg, 1912-13); Haggard, *Louis XI and Charles the Bold* (New York, 1913).

BURGUNDY, LOUIS, DUKE OF (1682-1712). The grandson of Louis XIV of France and Dauphin of France after the death of his father (1711). Born at Versailles, he grew up imperious, headstrong, and with an utterly ungovernable temper. His education was intrusted to Fénelon, Archbishop of Cambrai, who corrected his early faults, but left him narrow, haughty, and so devoted to religious observances that his grandfather in inviting him to enter a council of war added the proviso "unless you would rather go to vespers." In 1697 he was married to Marie Adelaide, daughter of the Duke of Savoy, to whom he became devotedly attached. He was put in nominal command of the French forces in Flanders in 1701, but he failed to show any remarkable ability, and the result of the unfortunate campaign of 1708 was laid at his door, after which he returned discredited to Paris. But with age and experience his character changed decidedly for the better, and when he became Dauphin after the death of his father he was looked on as the hope of the French nation. Throwing himself into the party of Saint-Simon and his old teacher Fénelon, he boldly advocated liberal measures that would have removed many of the worst evils of the old régime. But before his party had more than barely outlined their scheme, he was fatally stricken with smallpox (February, 1712). With him perished the hopes of his party. His wife, the joy of the French court, had died a few days before, and both were carried in the same hearse to Saint-Denis. His second son later became King of France as Louis XV. Consult: Saint-Simon, *Mémoires* (Paris, 1829-30), and Farmer, *Versailles and the Court under Louis XV* (New York, 1896).

BURGUNDY MIXTURE. See FUNGICIDES.

BURGUNDY PITCH. A resinous substance used as a basis for plasters in pharmacy and for a variety of other purposes. It is obtained from the resinous exudation of the *Abies excelsa* (natural order Coniferae), growing in southern Europe. The exuded resin is melted in hot water to remove part of the volatile oil contained in it and strained through coarse cloth. It is quite hard and brittle, has a brown color, a sweetish taste, and an agreeable odor similar to that of turpentine. It is composed mainly of resin and a volatile oil. A substance resembling Burgundy pitch can be prepared from common resin and palm oil; this substance, however, is insoluble in glacial acetic acid, in which genuine Burgundy pitch dissolves almost entirely.

BURGUNDY WINE. See WINE.

BURHANPUR, būr'hān-pūr' (*Bohra*, a Mohammedan sect + Skt. *pura*, city). A town in the Nimar District, Central Provinces, British India, once the capital of Khandesh, 210 miles east of Surat, with a population, 1901, of 33,341; 1911, 22,777 (Map: India, C 4). It is on a high bank of the Tapi River, surrounded by a rampart of brick, and has in the centre a

palace of brick known as the Red Fort, built by Akbar, who adorned the town with marble halls, a mosque, and gardens, now nearly in ruins. It was formerly a city of great importance, noted for manufactures of gold and silver brocade, silks, cotton, and muslin, which are still carried on, although not so extensively as formerly. Under the Moguls the city had an area of 5 square miles.

BURHEL (būr'el), or **BHARAL** (E. Ind.). The blue wild sheep (*Ovis*, or *Pseudovis, nahura*) of Tibet, which resembles the aouda in many particulars and is a transition form between the goats and sheep, "both these species having no suborbital gland and no lachrymal fossæ, while their comparatively smooth and olive-colored horns show a decided approximation to those of the goats." Other similarities exist in the skull. This species is 3 feet tall, and in winter its coarse fleece is dark ashy blue, but in summer it is much browner, with the ventral surfaces and the tail white, and the nose, throat, and front, and a line along the sides deep black. The horns of the ram are smooth, rounded, start "very close together on the forehead, describe a half-circle of 2 feet or so, and are directed very much outward and backward." Those of the ewe are only 8 inches long and simply curve backward. A sportsman, writing in the *Field*, of London, Jan. 19, 1895, of his experience with this animal, says: "This sheep is very generally distributed over the mountains of the district which it inhabits (never below 10,000 feet), and one is constantly coming across tracks of flocks comprising from 2 or 3 to 40 or 50 individuals; but I have found it quite as hard to approach as any of the sheep—in fact, the circumstance that the old males are frequently in company with the rest of the flock all the year round, instead of separating from the females and the young rams, as is the case with most wild animals, renders it often very difficult to make a successful stalk. The ewes are excessively wary, and one or two seem always to post themselves as sentinels while the rest of the flock are grazing or lying down." Consult books mentioned under **GOAT** and **SHEEP**; and see **PLATE OF WILD GOATS AND SHEEP**.

BURI, bū'rē, or **BURE**. A mythical being who stands in Norse mythology as the grandfather of Odin, the supreme deity in that religion. In the Younger Edda (see **EDDA**) the following account is given of the creation of the world: Many ages before the earth was made, Niflheim (the nebulous or shadowy region) was formed; in the middle of Niflheim was a spring called Hvergelmir (the roaring caldron), from which 12 ice-cold rivers flowed. When the rivers had flowed far from their sources the venom which they rolled along hardened, as does the dross that runs from a furnace, and became ice. The ice stood still, and the vapor that gathered over it froze into rime, or frosty snow, and in this manner were formed the Ginnungagap (the yawning abyss, or all space), many layers of congealed vapor, piled one upon another. But the southern part of Ginnungagap was filled with sparks and flashes of fire that flew into it from Muspelheim (the home of elemental fire). In the conflict of elements the rime was melted, and the melted drops took a human semblance, and the being thus formed was named Ymir (the primordial giant). Another creature formed from this conflict of heat and cold was a cow named Audhumla (darkness), and from her teats ran four streams of milk, on which

Ymir was fed. "But," asked Gylfi, "on what did the cow feed?" The answer was that she supported herself by licking the surrounding stones, which were covered with hoarfrost and salt. The first day she licked there appeared the hair of a man: the second day the head came to view; and the third day the whole man appeared. This man was called Buri, or Bure. He was fair of face, great, and mighty. This first creature in the form of man was the father of Bōr (meaning 'born'), who took for his wife Bestla, the daughter of the giant Bolthorn (calamity or evil), and this pair were the parents of Odin, the Norse all-father, and his brothers Vile and Ve. No wife is named for Buri, nor is anything further related of him. Consult Anderson, *Norse Mythology* (Chicago, 1901), and Mortensen, *A Handbook of Norse Mythology* (New York, 1913).

BURIAL, bër'ī-al (AS. *byrgels*, tomb, from *byrgan*, to bury, hide in the ground, Ger. *bergen*, to hide, conceal). The method prevalent among civilized nations of disposing of the dead by hiding them in the earth. Although some peoples have had other customs—as that of the Guebres, who left the corpses to birds of prey, or that of the Hindus, who consigned them to the river Ganges—the general tendency of mankind has always been to conceal the dead from the sight of the living. Various as the methods of accomplishing this end have been, they resolve themselves into three great classifications: (1) inhumation, or the consigning of the body to the earth; (2) incineration, or the burning of the body and the burial of the ashes; and (3) the embalming of the body. It is natural that the first and simplest of these methods should have prevailed among savages and semicivilized peoples, as, e.g., during the states of the early and late Stone ages, when the dead were simply laid away in cases in crevices. In civilized communities the methods of burial varied with country, race, and religious practices rather than with periods of civilization, and the same race sometimes altered its customs through the influence of religious change or foreign conquest.

Babylonia. In ancient Mesopotamia inhumation was the rule, and cremation practically unknown. The bodies were often placed on the ground or near the surface and a mound raised over them. Sometimes they rested on a wooden board, were wrapped in a mat of reeds or palm fibres, and were placed on the side or back or doubled up in a sitting posture. The custom then arose of placing the body in an earthen dish or jar, or in two jars fastened together by bitumen at the mouth. The dead were buried in their garments, with their staff and signet ornaments, weapons and utensils. The priests were called in to burn incense, sprinkle water, and conjure the evil spirits. There were professional mourners also, lamenting and singing dirges, who followed the bier to the grave. The cemeteries were laid out in regular streets, but the sepulchral vaults were extremely simple. No stately tombs or mausoleums have been found in Babylonia. The belief in the after life and its material existence is shown by the practice of taking to the grave food of all sorts and water. Offerings and libations to ancestors were common. Notwithstanding the fearful floods and the primitive character of the brick vaults, the careful methods of closing the graves and of underdraining them have kept these Babylonian cemeteries in remarkable preservation.

Egypt. The earliest Egyptians buried their dead in flat-bottomed oval or rectangular pits, dug into the sand. The body was placed in the embryonic position, lying on the left side. Articles of the toilet and jars of pottery or stone containing food and drink for his nourishment, flint weapons and clay models of objects he might need in the after life, were interred with him. The tombs were roofed over with branches and covered with stone and gravel, and later were lined with sun-dried brick. Thousands of such tombs, situated along the western fringe of the desert and dating from 7000 to 3400 B.C., have been excavated during the last few years. This form of tomb developed into the mastaba (q.v.) and the pyramid (q.v.). At a very early date religion decreed the preservation of the body by embalming and the construction of a tomb of considerable size. Of the four elements composing man, the body, the double, or *ka*, the soul, or *bi*, and the spiritual flame, or *khu*, each had to be provided for in the burial arrangements. On the preservation of the body depended the continued existence of the other three elements. The "double" lived always with the mummy and consumed the offerings periodically brought to its reception chamber. The soul and the spirit returned after a long period from the other world to renew contact with their former envelope. Portraits of the deceased were placed in the tomb so that they could still be recognized by them, even if the mummy were injured or destroyed. The clearer conception of the after life in its material aspect held by the Egyptians made them develop fully what is found only in germ in Babylonia. Immediately after death, the priest came with his assistants to take entire charge of the body and funeral. He closed the eyes of the deceased; handed his body over to the embalmers; saw to the preparation of the mausoleum with its paintings and images—if the deceased were well-to-do; engaged the mourners to parade the streets at stated intervals with loud lamentations, and directed the exhibition of family grief and the preparations for the procession. Meanwhile the embalming had been proceeding. First the viscera and heart were removed, stuffed with unguents, and placed in four jars; the brain, also, was set aside to dry, and the body placed to soak for 70 days in liquid litron or natron.

Phœnicia. The Phœnicians imagined the soul to be a restless and pitiable double, abiding either near the body of the deceased or in a gloomy underworld. The body was not fully embalmed, but was anointed and enveloped in linen bandages impregnated with substances to retard decomposition. Bodies were placed in natural grottoes or artificial chambers, or else laid in the bare earth; though they were commonly inclosed in coffins or sarcophagi, sometimes of anthropoid shape, in imitation of Egypt. Around the dead were objects of daily use and ornaments. The cippus or stele to mark the tomb developed often into a monument or chapel, especially in Hellenistic times. The early Hebrew custom is shown by Abraham's purchase of the cave of Machpelah, and occasional use of embalming in the case of the kings is proved by 2 Chron. xvi. 14.

Persia. Among the Persians, especially the stricter following of the Magi, the ritual forbade the consigning of the body to earth, water, or fire, as these elements would thereby be polluted. The less strict Persians coated the body with a

thick layer of wax and then buried it. The stricter devotees exposed it in the open to birds and beasts of prey, and the more thoroughly it was consumed by them the better the omen. The bones were then placed in an urn or a rock-cut tomb above the ground level. The soul, after dwelling near the body three days, departed on the morning of the fourth for the place of judgment. If the soul had been sinful, it was accompanied over tainted plains by an evil wind and preceded by a hideous female, emblem of its evil deeds, and after being condemned in the eternal judgment hall was cast over a bridge into the abyss. The righteous soul, preceded by a beautiful maiden typifying its good deeds, passed safely, at the end of its luminous journey, into paradise.

Greece. In the Ægean civilization the prehistoric stage is represented by the tombs of Crete, graves near Troy (Hissarlik), where the bodies were buried in simple trenches or in terracotta jars with utensils in stone and bone. The Mycenaean age is best represented by the royal tombs found by Schliemann at Mycenæ. These were rectangular trenches cut in the rock to a depth of 10 to 16 feet and closed by stone slabs. They were almost chambers and held more than one body. The bodies, which may have been slightly embalmed before burial, wore all their most beautiful jewelry and ornaments or arms and even had gold face masks. A sculptured stele marked the site at the ground level, and the entire group was surrounded by a stone inclosure. These tombs and the other two Mycenaean types, those cut into the face of the rock and the domical tombs, are one and all family tombs and show the universal use of inhumation as opposed to incineration. The presence of numerous bones of many kinds of animals shows the custom of offering sacrifices to the deceased through a long period. The lavish burial with the body of the choicest costumes, ornaments, utensils, furniture, arms, and religious objects shows that the deceased was supposed to continue in the tomb itself a life analogous to his earthy one. Vaphio, Mycenæ, Palamidi, Dimini, Orchomenos, Argos (Heræum), Sparta, Menidi, Epidaurus, and the islands, such as Rhodes and Melos, have furnished every variety of such forms of burial. In the Homeric age these primitive customs were modified, mainly by the introduction of incineration as the prevailing fashion (*Iliad*, xxiii, 164, 178; xxiv, 47-78; *Odyssey*, x, 579; xi, 27), accompanied by human sacrifices, which may have also been known in the Mycenaean age. The burning and burying of the body forces the soul to abandon the earth for Hades. Burial was universally obligatory; its neglect by relatives, a crime. The ceremony preceding burial was: the closing of the eyes and lips; the rubbing, anointing, and robing of the body; the exposure on the funeral bed in the house for a number of days, after partial embalming, with much lamentation and chanting; the burning of the body on a pyre together with the favorite animals and objects, so that they could accompany the deceased to Hades; the extinguishing of the pyre with wine, gathering of the bones and ashes into urns or vases, which were buried under a mound marked by a stele; finally, a funeral repast and games.

The same material view of the future life prevailed during the succeeding historic period, although extravagances of grief and of expense

and great length of exposition of the body were discouraged by law. There were four regular stages: (1) arranging for the funeral; (2) exposition; (3) transportation; (4) burial. In preparing the body a new class of ornaments was created—rings, necklaces, diadems, brooches, annulets—too light for use and made for the express purpose of burial. It was in Asia Minor and the region of the Bosphorus especially that great luxury was attained in this branch of art. In the exposition (*prothesis*) one white covering was placed over the bed, a second one around the body, and a third over all. Noisy demonstrations and the hiring of foreign singers were forbidden. The time for the transportation of the body was towards the close of night, to avoid polluting the rays of the sun; and during it no name of a god was pronounced. The funeral bed was often crowned by a canopy, and was either carried by bearers (who were always at first the parents, but later hired men), or on a chariot drawn by two horses or mules. The laws of Solon curtailed the magnificence of the procession. The common disposition of the remains during this period was inhumation in a trench, though cremation was sometimes practiced, and the ashes then commonly placed in a bronze urn. Large necropolises were now formed by the joining of family groups of tombs—always outside the city, except in Sparta. The site of the tomb was marked in several ways—by mounds, steles, *ædícula*, or cippi. After the burial there were libations, with the breaking of vases and figurines and the burying of objects. The continuous cult of the tomb, with anniversary libations and visits, was rigorously observed. However, the absence of games and festivals, except in the case of public funerals of the greatest men, made the ceremony less conspicuous than in prehistoric times.

Italy. The Etruscans and other early Italian races practiced inhumation at first, as is shown by primitive coffins hewn out of tree trunks, by the persistent use of the rite of *humatio*, and by unanimous antique literary tradition. Still, the earliest necropolises yet excavated show the universal practice of incineration in the ninth and eighth centuries, during the "Villanova" period. The primitive cinerary Villanova or Cabin urns containing the ashes and a few rude vases and ornaments were lowered into small cylindrical well tombs. The seventh century brought a change: inhumation displaced cremation, and trench tombs with long stone sarcophagi and a richer sepulchral furniture replaced the urn and well tomb. Chamber tombs soon became the fashion, and led to the use of highly carved and painted sarcophagi of terra cotta and marble until the Roman conquest. The numerous frescoes and sculptures in these chambers and their varied furniture give the only information available regarding Etruscan burial customs. They show clearly various stages after death: the closing of the eyes; the arraying; the exposition of the body on a couch at the entrance of the house; the official act of mourning to the accompaniment of music; the funeral procession, often of a triumphal character, with musicians, *quadriga*, friends, and mourners; the deposit of the body on a stone bench in the tomb or on a funeral bed or in a sarcophagus; the funeral banquet, which was so favorite an observance with the Etruscans, accompanied by music, dancing, and games, including races, wrestling, plays and shows, and even gladiatorial contests.

Rome. The Romans carried burial ceremonial to a pitch of intricacy and splendor surpassing all nations except, perhaps, the Egyptians. While they at first practiced inhumation, the practice of cremation became supreme in the second century B.C., lasting until it was largely superseded again by inhumation under the Antonines. The burial rites varied, according as the funeral was public or private, plebeian, patrician, or military. In important cases all citizens were invited to take part by the public crier, but ordinarily only relatives and friends took part. In the interval between the death and the funeral the usual ceremonies were observed; closing of the eyes by the children or other relatives; the calling aloud on the defunct; the washing, anointing, and robing of the body in white, and the placing of a crown on the head, and sometimes a coin in the mouth. Partial or complete embalming was practiced. The body remained from three to seven days on a state couch in the vestibule of the house, surrounded with flowers and burning perfumes. The funeral procession took place at night by torchlight; but under the Empire daylight funerals became the rule except for children and the poor. The body was actually carried on its litter by pallbearers—the nearest relatives—but a figure of the deceased was often drawn in a chariot. Extravagant demonstrations of grief were produced by hired mourners, and there was a band of musicians, mainly trumpeters and flute players, to whom, on special occasions, singers, buffoons, and actors were added. The growing unwillingness of parents and friends to walk in the funeral procession—in Imperial times—is shown by testamentary inducements to do so. The proper mourning costume was prescribed. The procession went directly to the tomb, in case of inhumation, or to the funeral pyre, in case of cremation. Arms, ornaments, favorite animals, and numerous presents were thrown into the burning pyre. The tombs where the ashes of many persons were deposited together after the rite of cremation were called *columbaria*. In both rites the tombs were ordinarily on the private property of the deceased. Elaborate ritual and memorial ceremonies followed burial.

Christian Burial. Christianity abolished cremation. The belief in the resurrection of the body made inhumation preferable. Embalming was not practiced, except occasionally, though spices and unguents were used to retard decay. Several of the Roman burial customs survived in certain regions until the Middle Ages, such as the placing of a small coin (*obolus*) in the mouth and the use of charms. The use of separate tombs was abandoned in favor of cemeteries. These were either subterranean—a class popularly called catacombs (q.v.)—or above ground (*sub die*). The catacombs could be used only where the subsoil contained strata of rather soft, friable rock, like tufa. They consisted of narrow galleries cut in the solid rock, in which the side walls were honeycombed with rows of narrow niches just long enough and deep enough to receive the body or bodies, the opening being then closed with a slab on which the name of the deceased was usually inscribed. The more distinguished persons were buried in the chambers opening out of these passages in marble sarcophagi, often carved, or in table tombs under arched tops. With the close of the era of persecution in the fourth century, these subterranean cemeteries were discontinued,

and as all the burial ceremonies were in the hands of the clergy, it became natural to attach the cemeteries, wherever possible, to the churches, especially to suburban churches. Often there were built parallel brick walls with rows of shelves for the bodies. There were no sepulchral chambers, but the bodies were laid in regular rows of trenches, sometimes merely excavated, sometimes constructed of brick or stone work, while at other times the trenches contained plain sarcophagi of different materials. This custom has continued with but one important variation, the introduction during the Middle Ages of the custom of burying within the church itself, and in the cloisters attached to it. This led to the use of magnificent sepulchral monuments, which became an important part of church ornament. Each monastery also buried its members in a cemetery attached to its church. Often the space under the pavement of churches was honeycombed with tombs, frequently marked by sepulchral slabs. Certain churches, such as Westminster Abbey and Saint-Denis, became national funerary Halls of Fame. There were also, from an early date, special sepulchral chapels and oratories for saints, martyrs, and other personages.

The Northern nations, such as the Goths, preserved after their conversion some of their old funeral customs, such as the burial of arms, jewelry, and other objects of value in great numbers with the deceased. As a rule, however, the ancient custom of burying articles of value in the tomb gradually ceased during the poverty of the early Middle Ages and was never revived. The ceremonial connected with Christian burial is a regular part of the liturgy of the different branches and denominations and took definite form at an early date. (See LITURGY.) While at first the dead were buried at the cost of the Church, after the fourth century this was done only for the poor. The eyes and mouth were closed by the nearest relative, the body washed and anointed—a custom which became obsolete after the tenth century. The ointments used were for partial preservation of the body. The body was then closely swathed in white linen and bound. Very soon the custom was introduced, especially in the case of the clergy and the nobility, of burying in the richest vestments, and the finest examples of early stuffs have been found in tombs. After the exposure of the body in the house—usually in an upper or inner chamber—the bishop, with his clergy, visited the house, recited prayers, and sprinkled it with holy water; and the ceremony included a eulogium of the deceased, which was often pronounced in the church. Most of these early customs have survived.

For further information as to burial rites, particularly those of the modern period, see CEMETERY; CEMETERY LAWS; CORPSE; MORTUARY CUSTOMS; CREMATION OF THE DEAD.

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1891); Zehetmaier, in *Beiträge zur Kunstgeschichte* (Leipzig, 1907); Wagner, "Death and Burial," in *Manners, Customs, and Observances* (London, 1895); Hasenclever, *Der altchristliche Gräberschmuck* (Brunswick, 1886); Yucasovic, "Funeral Customs and Rites among the Southern Slavs in Ancient and Modern Times," in *Archives of the International Folk-Lore Association* (Chicago, 1898); Preuss, *Die Begräbnisarten der Amerikaner und Nordasiaten* (Königsberg, 1894); Yarrow, "Mortuary Customs of North American Indians," *First Smithsonian Report, Bureau of Ethnology* (Washington, 1881); Walker, *Gatherings from Graveyards, Particularly Those of London* (London, 1839); Wickes, *Sepulture: Its Methods and Requisites* (Philadelphia, 1884); Brand, *Popular Antiquities* (London, 1877).

BURIATS, bu'rè-àts' (in Russ. *buryaty*). A Mongol people numbering some 300,000, inhabiting the region about Lake Baikal (particularly the Irkutsk country), in southern Siberia. In their less marked Mongolian physical characteristics, their tendency to become farmers, and the preservation by a considerable portion of the primitive shamanism of the original stock, the Buriats differ from their kindred, the eastern and western Mongols. In some branches of industry (metal work, leather, etc.) they show much skill, and certain members have even acquired some scientific education. Before Russian contact the Buriats were subject more or less to Chinese influence and intermixture with other Siberian peoples (Tungus, Yakuts, etc.). The best account of these people is that of Dr. N. Melnikoff in the *Internationales Archiv für Ethnographie* for 1899, where the good and bad effects of Russian influence and the present condition of the Buriats are discussed at length. Consult also Stadling, *Shamanismen i Norra Asien* (Stockholm, 1912). The Buriats are increasing in numbers, and assimilation with the Russian population of Siberia, not extinction, seems to be their destiny. During the troubles in Russia, after the close of the war with Japan, a considerable number of the "Christian" Buriats (converted to the Orthodox Greek church) returned to their ancient shamanism. The Buriats have now a written language, newspapers, schools, etc. Lamaism is still the prevailing religion of a large part of the Buriats, and it was from this source that their written language came. The Lamaistic Buriats stand high among Siberian native peoples. Consult Curtin, *Journey in Southern Siberia* (Boston, 1909). See SIBERIA, *Ethnology*.

BURIDAN, bu'rè-dān', JEAN (c.1300-c.58). A French scholastic metaphysician of the nominalistic party. He was born at Béthune, in Artois, studied in Paris under Occam, and was rector of the university there in 1327. Little is known of his life. It is related, but also disputed, that Buridan was driven from France, fled to Austria, and there gave the impetus to the founding of the University of Vienna. He took no part in theological discussions. His name is popularly connected with the *pons asinorum* (in logic, not in geometry) and with the ass between two haystacks. The former was a name given to any laboriously obtained syllogistic middle term, which acts as a bridge to connect major and minor terms. (See LOGIC.) Such a term was called "an ass's bridge," because, according to Aristotle, in a clear reasoner's thought this middle term is spontane-

ously suggested. The other ass, famous as "Buridan's ass," carefully placed between two equally alluring bundles of hay, illustrated the doctrine of *determinism* (q.v.). This ass, however, does not appear in Buridan's extant writings, and may have been the invention of some caricaturist. His chief works are: *Summa de Dialectica* (1487); *Compendium Logicae* (1489); *In Aristotelis Metaphysica* (1518); *Quæstiones in Decem Libros Ethicorum Aristotelis* (1489). Consult Prantl, *Geschichte der Logik*, vol. iv (Leipzig, 1855-70). Consult Townsend, *Great Schoolmen of the Middle Ages* (New York, 1905), and Rickaby, *Scholasticism* (London, 1908). See NOMINALISM.

BURIN. A port of entry, capital of a district of the same name, Newfoundland, on Placentia Bay, 190 miles south of St. John's (Map: Newfoundland, E 51). It has a well-protected harbor, important fisheries, and carries on a considerable trade with St. Pierre. Pop., 1901, 2719; 1911, 2783.

BURIN (Fr., probably from OHG. *bora*, Eng. *bore*, gimlet), or GRAVER. The principal instrument used in line engraving. It is made of tempered steel, and is of prismatic form, the graving end being ground off obliquely to a sharp point. Attached to a rounded handle, held in the palm of the hand, it cuts furrows in the copper plate according to the pressure exerted. The style of a master is frequently described by the expression, *soft burin*, *graphic burin*, *brilliant burin*, or whatever other character may belong to it. See LINE ENGRAVING; ETCHING.

BURITI (bū'ri-tē') **PALM** (Portug. from native Brazilian). A beautiful palm which grows in great abundance in the swamps of some parts of the north of Brazil. It is *Mauritia vinifera*, one of several species of the genus *Mauritia*, and is one of the loftiest of palms. Its leaves are fan-shaped and form a large globular head at the top of the stem. It produces a great number of nuts about the size of a small hen's egg, covered with rhomboidal scales arranged in a spiral. Between these scales and the endosperm of the nut there is an oily, reddish pulp, which is boiled with sugar and made into a sweetmeat. An emulsion is also prepared from it, which, when sweetened with sugar, is a very palatable beverage. The juice of the stem also makes a very agreeable drink. To obtain it, the tree is usually cut down, when several holes about 6 inches square, 3 inches deep, and 6 feet apart, are cut in the trunk with a small axe; and these in a short time are filled with a reddish-colored liquid, having much the flavor of sweet wine. There are about 15 species of *Mauritia*, all of them American.

BURKE, EDMUND (1729-97). An English statesman and orator. He was born in Dublin, where his father had an extensive practice as an attorney. As a schoolboy he displayed those traits of character and the germs of those powers which ultimately gave him greatness. His preparatory training was gained at a school in Ballitore, county Kildare, kept by Abraham Shackleton, a member of the Society of Friends. To this man, whom he always held in affectionate esteem, he believed he owed the best part of his education. In 1743 Burke entered Trinity College, Dublin, where he seems mainly to have devoted himself to his favorite studies of poetry, oratory, history, and metaphysics. He made himself acquainted with Latin writers, particularly with Cicero, whom he accepted as a model

"in eloquence, in policy, in ethics, and philosophy." In February, 1748, he graduated B.A. and in 1751 took his degree as master of arts. In the interval (1750), being destined for the English bar, he proceeded to London, to keep his terms at the Middle Temple, where he had been entered in 1748. To legal studies, however, he never took kindly, and ultimately he abandoned the idea of becoming a barrister. During the years 1750-56 he would appear to have occupied himself mainly in traveling through England and on the Continent, enjoying the society of literary men.

When yet at the university Burke had achieved a local reputation for literary talent and eloquence. Among the compositions of his undergraduate life the most noticeable perhaps is his translation of the conclusion of the Second Georgic of Vergil, which shows poetic talent of no mean order. His first important publication, however, was the celebrated *Vindication of Natural Society*, written in imitation and ridicule of the style and reasoning of Lord Bolingbroke, in which, with well-concealed irony, he endeavored to confute his lordship's views of society by a *reductio ad absurdum*. This work, published anonymously in 1756, attracted considerable attention. Soon after, in the same year, appeared his well-known essay, *The Philosophical Inquiry into the Origin of Our Ideas on the Sublime and Beautiful*—a work which gained the praise of Johnson and Lessing.

The essay on the Sublime and Beautiful, although of little real value, attained rapid popularity, and its author soon found himself courted by all the eminent men of his time. Garrick was already one of his friends; among them he soon could count Reynolds, Soame Jenyns, Lord Lyttelton, Goldsmith, Hume, and Dr. Johnson. Notwithstanding this popularity his progress continued slow; for three years he had to occupy himself with periodical writing, devoting his leisure principally to political subjects. What is considered a joint work of Burke and his cousin, William Burke, appeared in 1757—in *Account of the European Settlements in America*—and shows how carefully at this date he had studied the condition of the Colonies. During the next year he began his writing for the *Annual Register*, the first volume of which appeared in 1759. In 1761 Mr. W. G. Hamilton ("Single-speech" Hamilton), then Secretary for Ireland, having appointed him his private secretary, he returned to Dublin, where during two years' service he demonstrated his aptitude for political business, receiving in 1763, in reward for his services, a pension on the Irish establishment of £300, which, however, he did not long enjoy.

Returning to London in 1764, he became a member of the literary club which met at the Turk's Head in Gerard Street, and whose history is associated with almost every considerable name in the literature of the period. But literary society did not call off his attention from the chances of a political career. He became private secretary to the Marquis of Rockingham, on his becoming Premier (1765), and entered Parliament as a member for Wendover (1766). Here his eloquence at once gave him the reputation of being "the first man in the Commons." The Rockingham administration, however, lived only a few months, and with it terminated this, his second political employment. He was successively member for Wendover, Bristol, and

Malton; his parliamentary life extended without intermission to 1794. Twice he held the post of paymaster of the forces, once under Rockingham, and again under Lord North, with the standing of a privy councillor. After a career in Parliament remarkable for the laboriousness, earnestness, and brilliancy with which every duty was discharged, and extending over nearly 30 years, he retired at last, receiving the thanks of the Commons for his numerous public services, and rewarded by the government, on the express request of his sovereign, with pensions amounting in all to several thousand pounds. He administered the office of paymaster of the forces with scrupulous regard to public economy and sacrificed all the perquisites of his office, exhibiting a severe integrity then unusual among public men. In his relations with the constituency of Bristol, which was alienated from him by his advocacy of the claims of the Roman Catholics and of the opening up of the trade of Ireland, he was the first to maintain the doctrine of the independence of parliamentary representatives—that they are not machines to vote for measures approved by their constituencies simply for that reason, but men and thinkers chosen by them calmly to consider and legislate for the good of the Commonwealth. During his career he rendered more important service to the cause of humanity than any other man of his time in Europe: he prepared the way for the abolition of the slave-trade, a measure which was destined to ripen to success in the hands of Wilberforce; he advocated the cause of humanity in India against the voracious greed of stockholders, who regarded its millions simply as materials for plunder, and largely contributed to improve the government of that country. Towards America he advocated a policy of justice and conciliation, which had it been adopted would have averted the horrors of the War of Independence and retained the Colonies in amity with the mother country. To the advocacy of every cause which he espoused he brought a capacity for patient research that was unlimited and an eloquence that has seldom been equalled.

Burke produced a vast number of writings on many subjects. Among the more important are: *Observations on a Pamphlet on the Present State of the Nation* (1769), replying to a paper variously ascribed to Fox or Grenville; *On the Cause of the Present Discontents* (1770); the celebrated speech in 1788 opening the trial of Warren Hastings (q.v.), and the equally famous speeches on *American Taxation* (1774) and on *Conciliation with America* (1775), which may perhaps be regarded as the most splendid monuments of his eloquence and statesmanship. On the other hand, with strange inconsistency, Burke resisted the movement for the reform of parliamentary representation; and he failed utterly to grasp the true meaning of the French Revolution. In 1790 appeared his *Reflections on the Revolution in France*, which had a remarkable success. Eleven editions were issued within the first year, and by 1797 more than 30,000 copies had been sold. It was received with delight by George III and by every enemy of the Revolution; yet, as a contribution to the literature of social history, the book is worthless. Burke was an ardent lover of order; and, deceived by the violence of the Jacobins, the man who had stood so bravely for the rights of the English colonists and the Hindus was unable to perceive that the French people were struggling to free themselves

from a class despotism far more oppressive. In his *Rights of Man* Thomas Paine made a trenchant reply to Burke's book; and it was also answered by Mackintosh in *Vindiciæ Gallicæ*, by Mary Wollstonecraft, John Thelwall, and some 30 other pamphleteers. Concerning its value there is the greatest divergence of opinion. To many it is the consummation of political wisdom; to others it appears unreliable, unfair, illogical, and intemperate. But friend and foe alike agree that it is the last great effort of Burke. From the day of its publication to the day of his death the mental powers of Burke steadily declined, as did also his influence.

Few men have been the subjects of higher panegyric than Burke, and, on the whole, few have better deserved praise. He was noble-minded, pure in his life, and a purist in politics. Intellectually he was most richly endowed. Possessing imagination, rare powers of observation, and indefatigable industry, there was no subject which he could not master, and none which, having mastered, he could not expound with unparalleled richness of language. But with these virtues and powers were conjoined defects, which, without bating their greatness, largely neutralized their influence. He was, it may be said, too literary to be a philosopher and too philosophic to be a politician. His career would seem to illustrate this position. His oratory astounded by its brilliancy rather than persuaded by its tone and argument; and in the long run the eloquence which failed to command the reason ceased to captivate the ear. The man who at first evoked the enthusiasm of the House by the brilliancy and power of his eloquence, did actually at last empty it by persistence in the monotonous splendors of his speeches. Passionate and in a great degree intractable, he was unsuited for party politics and drifted from all his connections, breaking up slowly all party ties and even the ties of friendship, till he reached at last almost a state of political isolation. At the same time it must not be forgotten how great an influence he, half philosopher, half politician, exercised on the counsels of the state; many of his views on politics and public economy were anticipations of science, as many of his previsions of the course of events were prophecies. He died on July 8, 1797.

There is an excellent edition of Burke's *Works* in 12 vols. (Boston, 1871); reprinted in 6 vols. in the Bohn series (London, 1880). His *Letters*, in 4 vols., were edited by Earl Fitzwilliam and Sir R. Bourke (London, 1844); and they are reprinted in the edition of the *Works* (London, 1852). Consult: A. J. George, editor, *Speeches on the American War, and Letter to the Sheriffs of Bristol* (Boston, 1891); James Prior, *Life* (5th ed., London, 1854); Croly, *Memoir of the Political Life of Burke* (Edinburgh, 1840); MacKnight, *History of the Life and Time of Burke* (3 vols., London, 1858); Morley, *Burke*, in the "Men of Letters Series" (New York, 1879), and *Historical Study* (New York, 1867); Maccunn, *The Political Philosophy of Burke* (London, 1913).

BURKE, JOHN (1787–1848). An Irish genealogist. He began literary work in London, but later made a study of genealogy, and in 1826 began the publication of the *Genealogical and Heraldic Dictionary of the Peerage and Baronetage of the United Kingdom* (9th ed., 1847), the first compilation of the sort to include both baronets and peers in alphabetical order. Chief among

his other publications are: *A General and Heraldic Dictionary of the Peerages of England, Ireland, and Scotland—Extinct, Dormant, and in Abeyance* (1831; 3d ed., 1846); and *A Genealogical and Heraldic History of the Commoners of Great Britain and Ireland* (4 vols., 1833-38), later editions of which appeared under the title, *A Dictionary of the Landed Gentry* (1855-57).

BURKE, JOHN (1859-). An American public official, born in Keokuk Co., Iowa. He received the degree of LL.B. from the University of Iowa in 1886, soon afterward removing to North Dakota. He was county judge of Rolette County for several years, a member of the North Dakota House of Representatives in 1891-93, and a State Senator in 1893-95. In 1906 he was elected Governor on the Democratic ticket, although the rest of the Democratic State ticket was defeated; he was reelected in 1908 and 1910. In 1913 he was appointed by President Wilson Treasurer of the United States.

BURKE, SIR JOHN BERNARD (1814-92). An Irish genealogist, son of John Burke. He was born in London, was educated at Caen College (Normandy), studied law at the Middle Temple, was admitted to the bar in 1839, and in 1853 became Ulster king-at-arms, and was knighted one year later. In 1855 he was appointed Keeper of the State Papers in Ireland. In this capacity, in 1866, he visited France for the purpose of studying the record system in use there. From 1847 until his death he edited the annual *Genealogical and Heraldic Dictionary of the Peerage and Baronage of the United Kingdom*. At various times he was also editor of other works of a similar character. Among his original publications are: *The Roll of Battle Abbey* (1848); *The Romance of the Aristocracy* (1855); *Vicissitudes of Families* (1883); *The Book of Precedence* (1881); *The Rise of Great Families* (1882).

BURKE, MAURICE FRANCIS (1845-1923). An American prelate, born in Ireland. He was educated at St. Mary's University, Chicago, Ill., and the American College, Rome, Italy, and was ordained priest of the Roman Catholic church in 1875. Pastor of St. Mary's Church, Joliet, Ill., from 1878 to 1887, he was in the latter year consecrated Bishop of Cheyenne, Wyo. In 1893 he was transferred to the see of St. Joseph, Mo.

BURKE, ROBERT O'HARA (1820-61). An Australian explorer, born at St. Cleram (county Galway), Ireland. He was educated in Belgium and when 20 years old enlisted in the Austrian army, in which he rose to be captain. In 1848 he became a member of the Irish constabulary. In 1853 he emigrated to Australia, where he was appointed inspector of police in Victoria. He received in 1860 the command of an expedition sent out to cross the continent from south to north. He and W. J. Wills reached the tidal waters of the Flinders River and were the first white men to cross the Australian continent. On the return journey both he and Wills died of starvation near Cooper's Creek. Their bodies, recovered in 1862, received a public burial early in 1863, and memorial statues were erected in Melbourne. Consult Howitt, *History of Discovery in Australia*, vol. ii (London, 1865).

BURKE, THOMAS MARTIN ALOYSIUS (1840-1915). A Roman Catholic prelate. He was born in Ireland, Jan. 10, 1840; was educated at the College of St. Michael, Toronto, and at St. Charles College, Maryland; graduated from St. Mary's Seminary, Baltimore, was ordained to

the Roman Catholic priesthood and assigned to duty at Albany, N. Y., 1864; became Vicar-General of the diocese in 1887, and was consecrated the fourth Bishop of Albany in 1894.

BURKE, THOMAS NICHOLAS (1830-83). A Roman Catholic orator known as "Father Tom." He was born in Galway, Ireland; studied theology in Rome and Perugia; joined the Order of St. Dominic, and after remaining five years in Italy was sent by his superiors to England. He soon established a reputation as an orator; preached in Ireland, England, and Italy; and in 1872 came to the United States as visitor to the Dominican convents in America, where his lectures and sermons attracted much attention. His lectures were reprinted under the title of *English Misrule in Ireland* (1873). Consult his *Life* by W. J. FitzPatrick (London, 1885) and *The Inner Life of Father Thomas Burke* (London, 1894).

BÜRKE, bür'kel. HEINRICH (1802-69). A German genre painter. He was born at Pirmasens, in the Palatinate, and studied at the Munich Academy, but learned most from the Dutch genre painters, whose works he carefully studied. Travels in the mountains of Bavaria, the Tirol, and in Italy furnished subjects for his pictures, which are small in form, minutely executed, and full of life and humor. They are to be found in most European galleries and in many private collections and include such subjects as "Scenes at an Inn," "Fête in the Alps," "Winter Scene in the Tirol," and others of like character.

BURKETT, ELMER JACOB (1867-). An American legislator, born in Mills Co., Iowa. He was educated at Tabor College, and, in law, at the University of Nebraska. In 1893 he began practice in Lincoln, in 1896 he was elected to the Nebraska House of Representatives, and from 1899 to 1905 he was a member of Congress. He then became United States Senator for the term ending 1911. In 1910 he was defeated for reelection in the senatorial primaries by G. M. Hitchcock (q.v.).

BURKING. A colloquial term in England and Scotland to describe a murder committed for the purpose of selling the victim's body for dissection. It came into use after the conviction, for an atrocious crime of this character, of one, William Burke, executed in Edinburgh, Jan. 28, 1829.

BURKITT, FRANCIS CRAWFORD (1864-). An English biblical scholar, born in London. He was educated at Harrow and at Trinity College, Cambridge, where he was lecturer in paleography in 1904-05, and then became Norrisian professor of divinity. St. Andrew's University conferred upon him a D.D. in 1911. His writings on biblical texts and early church history include: *The Old Latin and the Itala* (1896); *Early Christianity outside the Roman Empire* (1899); *Early Eastern Christianity* (1904; Ger. trans., 1906); *The Gospel History and its Transmission* (1906; 3d ed., 1911); *Earliest Sources for the Life of Jesus* (1910); and a preface to the English version, *Quest of the Historical Jesus* (1910), of Schweitzer's *Von Reimarus zu Wrede*. He holds that Matthew's and Luke's gospels are based on Mark, and he defends—against Wrede and others—the general accuracy of Mark. He translated from the German of Vollers *A Grammar of Modern Egyptian Arabic* (1895) and was an editor in the *Anecdota Oxoniensia of Relics of Palestinian Syriac Literature* (1896). In 1912 he

published *Syriac Forms of the New Testament Proper Names*.

BURKLEIN, BÜRK'lin, FRIEDRICH (1813-72). A German architect, born at Burk, in Franconia. He studied at the Munich Academy as a pupil of Gärtner—whom he assisted in the construction of the royal palace in Athens—and was active in the architectural development of Munich under King Maximilian II. He designed the Maximilianstrasse and built the Maximilianeum. As *Generalbaudirektor*, he constructed the Munich railway station (1847-49), his best work, in which Romanesque and Renaissance forms were blended and adapted to modern requirements with considerable skill.

BURLEIGH, BŪ'li, BENNET (1844-1914). An English war correspondent, born in Glasgow. As a youth he took part in the Civil War in the United States and was twice sentenced to death. He was Central News correspondent in the first Egyptian War, joined the staff of the London *Daily Telegraph* in 1882, and thereafter acted as correspondent in Egypt, Madagascar, South Africa, Morocco, and Greece, and also in the Russo-Japanese War, the Italian Campaign in Tripoli, and the Bulgarian War of 1912-13. He is author of *Two Campaigns* (1905), *Empire of the East* (1905), and many newspaper and magazine articles.

BURLEIGH, EDWIN CHICK (1843-1916). An American legislator, born at Linneus, Me., and educated at Houlton Academy. He was State land agent in 1876-78, during the same period serving as assistant clerk in the Maine House of Representatives, was clerk in the office of the State Treasurer in 1880-84, and in the latter year became Treasurer. From 1889 to 1892 he was Governor of Maine and from 1897 to 1911 a member of Congress. He was chosen United States Senator in January, 1913, as a Republican.

BURLEIGH, LORD. See CECIL, WILLIAM.

BURLESON, ALBERT SIDNEY (1863-). An American legislator and public official, born at San Marcos, Tex. He graduated from the University of Texas in 1884, was admitted to the bar, and for five years served as assistant city attorney of Austin. Of the 26th judicial district of Texas he was attorney in 1891-98. Elected member of Congress in 1899, he was several times reelected, finally resigning his seat in 1913 to become Postmaster-General in President Wilson's cabinet. In that office his energy and progressive plans at once commanded attention.

BURLESQUE. A dramatic or literary composition tending to excite laughter by an exaggerated travesty of some more serious work, or by a ludicrous contrast between the subject and the manner of treating it. A burlesque is distinct from a parody or satire, being of a broader, more pronounced type, and differs from a farce in being even more extravagant in its construction.

The burlesque in literature was first used as a distinct style by Berni, an Italian poet, who early in the fourteenth century published a volume of *Burlesque Rhymes*. The success of this book brought forth a host of imitators, among whom were Mauro and Caporali, and introduced the burlesque into France, where Sarrazin, and, later, Scarron, carried the new form to a high degree of excellence. *L'Enéide travestie* was the beginning of a long line of travesties in which Scarron burlesqued Paris, Amsterdam, society,

etc., and by which he established firmly his reputation as the greatest French writer of burlesque. In England burlesque developed early, along a somewhat irregular line. Chaucer, for instance, in his *Rime of Sir Thopas*, ridicules the long, dreary tales of the Middle Ages; Beaumont and Fletcher's *Knight of the Burning Pestle* is a travesty on ultra-chivalric romances; Butler's *Hudibras* contains burlesque motives; and still later *The Rejected Addresses* of the brothers Smith brought the English form of burlesque to a high level. In Spain Cervantes, with his immortal *Don Quixote*, created a new type of burlesque, which was imitated in the next century by Le Sage in France with his diverting history of *Gil Blas*. During the later history of literature there have been innumerable travesties, parodies, and burlesques of contemporary poems and authors, but, with the possible exception of those by Thomas Hood, none of them are of importance.

The dramatic burlesque has varied greatly in its form. Aristophanes uses it in his comedies; Euripides and Plautus contain germs of it; the Italian dramatist Gozzi employs it most successfully in his tragi-comedies; and under Molière burlesque per se reaches its highest dramatic excellence. The most noted of English burlesques on the stage are those of Planché, brought out in London in the years following 1818; and a rich vein of travesty runs through many of the plays of W. S. Gilbert (q.v.). But in modern times burlesque has degenerated from comedy to farce, and from farce to a musical medley of travesty and vaudeville. Indeed, in France the "vaudeville" corresponds to the English burlesque. Consult: Flügel, *Geschichte des Burlesken* (Leipzig, 1793); Morillot, *Scarron et le genre burlesque* (1888); "Burlesque Plays and Poems," in Morley's *Universal Library*.

BURLINGAME, ANSON (1820-70). An American politician and diplomatist. He was born at New Berlin, N. Y., but removed with his father to Ohio in 1823 and to Michigan 10 years later. He graduated at the University of Michigan in 1841 and at the Harvard Law School in 1846 and subsequently practiced law in Boston. In 1852 he became a member of the State Senate and in the following year was sent to the State Constitutional Convention. He was an enthusiastic worker in the Free-Soil party, especially in the presidential campaign of 1848; and in 1854 joined the American party and became one of its representatives in the Thirty-fourth Congress. His denunciation of Brooks's assault upon Senator Sumner provoked a challenge from Brooks, which he at once accepted, naming rifles as the weapons. Brooks did not fight. Burlingame was a Congressman until 1861, and in that year was sent as Minister to Austria, where the feeling against him, because he had favored Hungarian independence, led to a positive refusal to receive him as a diplomatic representative. He was then sent to China, where he remained as Minister until 1867, when, having completely gained the confidence of the Chinese government, he was appointed special Chinese envoy to the United States and various European Powers. In 1868 he negotiated with the United States government the "Burlingame Treaty," notable as marking the first acceptance by China of the principles of international law, and as granting important reciprocal privileges to the two Powers. Subsequently he negotiated important treaties with Great Britain, Denmark,

100 miles below Mandalay it is joined by the Chindwin, its largest branch. Its delta is very extensive, being nearly 200 miles in length, with an area of 18,000 square miles. These delta lands are extremely fertile, and densely populated. Rice is extensively cultivated throughout their extent. The mean discharge of the river at its mouth is estimated at 480,000 cubic feet per second, or about the same as that of the Ganges. It is subject to great floods in the rainy season, the flow at this time being often 18 times as great as at low water. It is navigable for large river steamers as far as Mandalay and for smaller craft some distance above Bhamo.

The Salwin is second only to the Irrawaddy in volume. This river throughout its course in Burma flows in a narrow valley, hemmed in by mountains and affording little level land for cultivation. It is navigable for only a short distance, owing to frequent rapids. The Sittang heads south of Mandalay and flows in a broad valley between the Irrawaddy and the Salwin. There are hundreds of minor streams in this well-watered country, but as they partake of the nature of mountain torrents, or are fed by them, they are useless for navigation, at least during the dry season. After the rainy season has begun the larger rivers are crowded with the native boats, for the waterways are the highways of the country. Even before the rain sets in the great rivers begin to swell, owing to the melting of the Himalayan snows. Towards the beginning of July the rivers and their tributaries usually rise 10 to 20 feet, submerging their banks and flooding the low lands. In many places, where in dry weather a cart track is found, there is during the wet season a creek navigable by heavily laden boats. The whole aspect of the country and the mode of life are thus changed with the alternations from dry to wet seasons. The villages of the delta are accessible by water, and it is at this season that the heavy traffic of the country is carried on. At Mandalay, where the Irrawaddy is about 2 miles wide, the water rises 30 feet, and in the Salwin there is a rise of 50 feet. These high-water levels are maintained with some fluctuations till September.

Climate. The climate of Burma ranges from that of the eastern Himalayas on the north to that of the tropical oceanic regions on the south, most of the country being in the torrid zone. The monsoons have a powerful effect upon the climate; in winter they blow from the north and northeast off the land and produce the dry season, and in summer they blow from the south and southwest off the sea, causing a heavy rainfall on the coast, and, moving up the river valleys, they carry a heavy precipitation far inland. The rainfall on the coast ranges from 120 to 160 inches and is much greater than this in some special localities. In the interior it is distributed irregularly, being affected by the local topography, but it is almost everywhere ample in amount and in many places excessive, ranging from 40 to 160 inches. The temperature changes with the latitude and altitude and proximity to the sea and with the direction of the monsoons. The coast temperatures are very constant, ranging from 80° to 90°. In the interior the contrast is greater, the temperature ranging from 50° or 60° in winter to 80° or 90° in summer, while at considerable altitudes, in the north, the country is

subject to frosts in the cold season. The great fertility of the soil in Burma is further increased in the lowlands by the fertilizing overflows of the rivers.

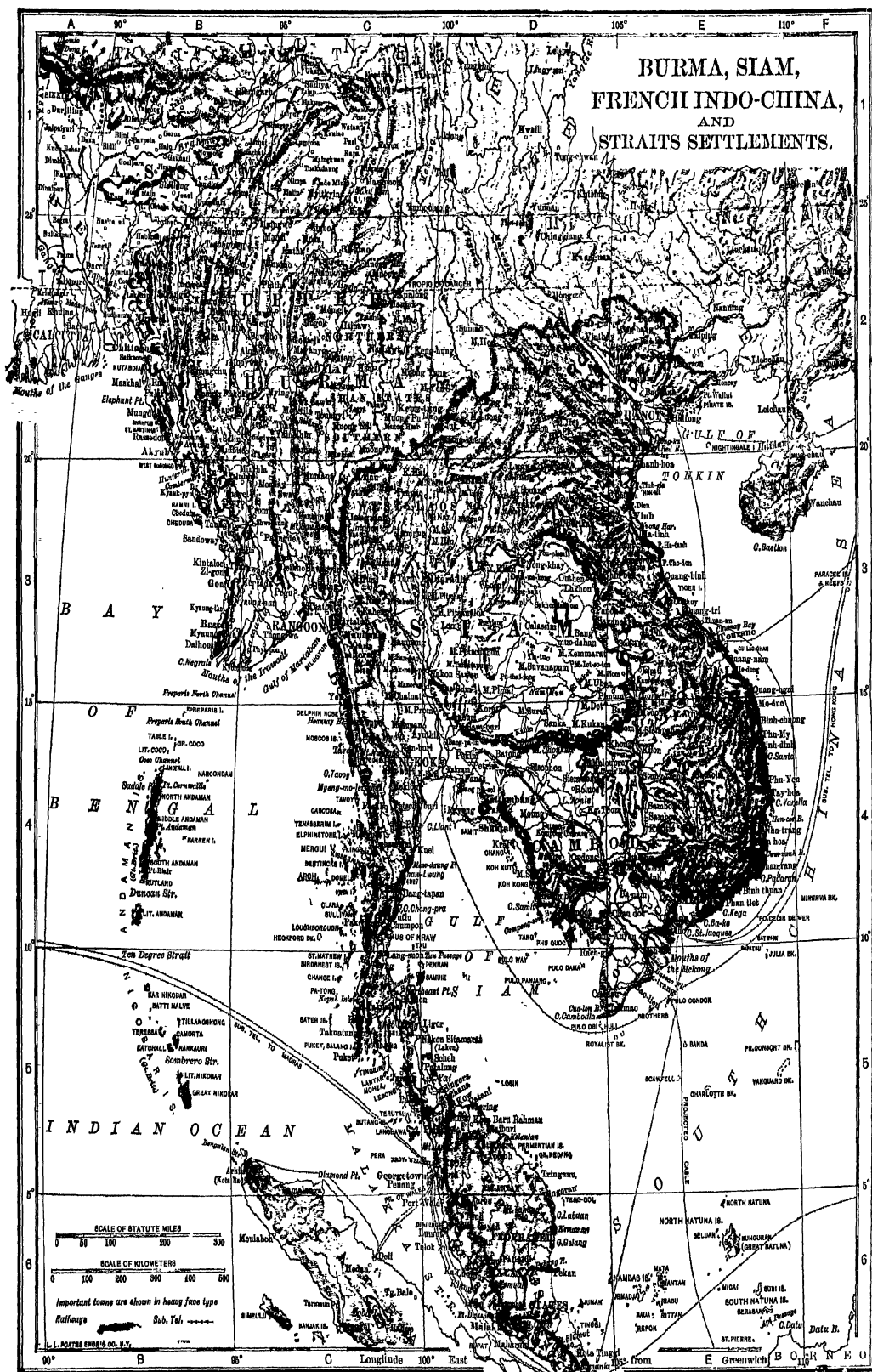
Flora. All the land not under cultivation is clothed with dense tropical forests, containing many fine dye and cabinet woods; and in the northern part of the country there is a great deal of teak, one of the most important exports. This wood has a peculiar odor, due to the presence of an oil which repels insects and protects it from decay. The oil tree, yielding gallons of oil every season, is found at the headwaters of the Salwin. Ironwood, which grows in among the bamboo, is abundant and widely utilized. Below the upper forests are the sandstone and laterite, on which the forests are open and stunted. Other trees are the palm, coconut, betel, and palmyra. Breaking the evergreen monotony of the riverside is the nipa palm, with immense fronds somewhat like the coconut. The rubber industry is still in its infancy, as hardly 12 plantations were operated in 1912. Many owners have their land in various stages of clearing and planting, however, as considerable land is available for this industry in the districts of Mergui, Amherst, Hauthawaddy, and Toungoo. The bamboo is universal and exceedingly useful. Planted in front of the houses are coconut and betel palms, giant bamboo, tamarind, mango, and jack, useful for their fruit and shade. The screw pine, castor-oil plant, crotons, begonias, caladiums, balsams, are cultivated in many places. Other fruits are limes, citrons, jujube, guava, cashew, custard-apple, orange, mangosteen, and durian, the latter being highly prized. The plantain and banana are the leading fruits of Burma; pine-apples and many garden vegetables also abound.

Fauna. Elephants, rhinoceroses, tigers, leopards, four species of deer, buffaloes, oxen, and goats, bears, tapirs, boars, wildcats, monkeys, gibbons, and crocodiles furnish game for the hunter. The Asiatic elephant attains a larger size here than elsewhere.

Burma is, in fact, the land of elephants; they are not only still plentiful in the wild state, but are used to a large extent as draught animals. The ox, horse, and buffalo also serve the purposes of labor, and especially among these the buffalo, which is a valuable draught animal in the muddy regions. Peacocks (the national emblem), silver pheasants, and jungle fowl of various sorts abound, as do also many other birds that are hunted for sport and food. Rats are almost a plague in the north provinces.

Mineral Resources. Burma is believed to be very rich in mineral resources, though little beyond a rough survey has been made, and most of the gold and silver used is imported from China, India, and Europe. Some of the rivers contain gold in the sand, which is washed out by the natives. Silver, copper, lead, iron, antimony, bismuth, and tin are also mined, but not as yet in large quantities. Large quantities of wolfram have been found in the Tavoy District. Nitrates, salt, limestone, and amber, serpentine, coal in abundance, and petroleum are found. The oil fields of Burma produce practically the whole output of petroleum in India. Their yearly output exceeds 230,000,000 gallons. The chief mineral wealth thus far developed has come from the mines of jade, ruby, and sapphire, which are discovered in the sand and gravel of Upper Burma. Mining is still in its

BURMA, SIAM,
FRENCH INDO-CHINA,
AND
STRAITS SETTLEMENTS.



rudimentary stages, but in recent years modern machinery has been introduced, and the amount of metal obtained from the ore, and the size of the slabs of the more valuable kinds of stone, are much larger than formerly. The principal source of income is derived from smelting by modern methods the refuse slag left by previous native workers. The finest variety of white marble found near Mandalay is much used in the Buddhist sculptures and in the decoration of temples.

Agriculture and Other Industries. Like most Indian provinces, Burma is chiefly agricultural, about two-thirds of the population being supported by the produce of the soil. The prevailing system of tenure is the *ryatucari*, i.e., the farmer leasing his land directly from the state and being assessed a tax in proportion to the area cultivated. The main agricultural product is rice, grown chiefly in the lowlands. The area under rice is increasing; in 1903-04 it was 14,540 square miles; rice covers about three-fourths of the cropped area in the whole of Burma, and in Lower Burma it forms more than eleven-twelfths of the total. The following figures are for Lower Burma and Upper Burma, respectively, in the year 1911-12: area, 54,994,247 and 53,804,895 acres; net area cropped, 8,719,787 and 4,620,129; under rice, 7,936,548 and 1,957,713; total food grains and pulses, 7,987,104 and 3,454,588 (including 484,905 acres great millet and 318,433 spiked millet in Upper Burma); oilseeds, 67,963 and 1,150,373; condiments and spices, 21,500 and 53,823; cotton, 20,190 and 171,979; tobacco, 59,228 and 29,670; orchard and garden, 402,928 and 34,350. The methods of cultivation are primitive. As the religion of the natives forbids meat eating, cattle are reared almost exclusively for draught purposes; but the use of milk and butter is beginning to be recognized. Burma has few large manufacturing establishments. The weaving of silk in Lower Burma and of cotton in Upper Burma is almost universal. Pottery is also produced extensively in both parts of the country. There are many skillful workers in gold, iron, and wood, and the native products have high artistic value.

Commerce and Transportation. The commerce of Burma has developed along with agriculture, and as the largest product is rice, it is also the chief article of export, usually constituting about 80 per cent of the total exports. The foreign trade is wholly controlled by foreigners, mostly English and Chinese, while the internal trade is in the hands of the natives. Usury prevails to a great extent, the rate of interest ranging from 1 to 6 per cent per month. The value of the sea-borne trade in merchandise (excluding government imports and exports) increased from £3,970,310 imports and £10,334,793 exports in the fiscal year 1903 to £7,788,659 imports and £16,935,308 exports in 1912. Besides rice, the exports include teak, cutch, petroleum, hides, rubber, cotton, and precious stones. The imports embrace cotton, wool, and silk goods, raw silks, metals and metal products, and salted fish. The foreign trade is with Great Britain and its colonies and to some extent with America. The registered trade of Burma proper by land increased from £1,129,728 imports and £933,944 exports in the fiscal year 1903 to £2,176,237 imports and £2,142,490 exports in 1912. This trade is mostly with China and the Shan States. Rangoon is the chief commercial centre

of the province; its imports in 1912 amounted to £7,623,787, and exports £13,566,108.

Under British rule new systems of roads and bridges have been introduced, three navigable canals dug, the Irrawaddy embanked and furnished with a large fleet of steamers, the chief cities fortified in modern style, and hospitals, courthouses, and churches built in many places. The principal railway traverses the greater part of the province in a generally north and south direction, from Rangoon 624 miles to Myitkyina, a town on the Irrawaddy and the headquarters of the most northerly district of Upper Burma. The line was begun at Rangoon in 1881; communication with Mandalay was opened in 1880 and with Myitkyina in 1899. The southern section is east and the northern section west of the Irrawaddy, connecting by a steam ferry at Sagaing, a few miles below Mandalay. The southern section has two branches: the first, from Thazi (on the main line about 80 miles south of Mandalay) northwest to Myingvan on the Irrawaddy; the second, from Myohaung (a junction just beyond the southern limits of Mandalay and across the Irrawaddy from Sagaing) northeast 180 miles into the northern Shan States as far as Lashio. A remarkable feature of the latter line is the steel viaduct, 1620 feet long and at its highest point 325 feet above ground, which spans the Gokteik gorge. The northern section of the main line has also two branches: one, from Sagaing west 73 miles to the Chindwin River at Monywa and Alon; the other, from Naba 15 miles southeast to Katha on the Irrawaddy. Another railway, the oldest in Burma, having been completed in 1877, extends from Rangoon northwest to Prome on the Irrawaddy. There is a branch line, completed in 1903, from Letpadan southwest to the left bank of the Irrawaddy opposite Henzada (where the river is crossed by a steam ferry) and thence to Bassein (115 miles). From Henzada a line extends north 66 miles to Kyangin. The rail connection of Rangoon with Moulmein (about 120 miles) has been undertaken. The total length of line open in 1891 was 609 miles; in 1905, 1340; in 1912, 1529. The lines are of metre gauge and are operated by the Burma Railways Company.

Government. Burma, before it came under the rule of Great Britain, was a despotic monarchy, though the king, or "Lord of the White Elephant," was assisted by a high council of four ministers of state, who gave orders to the governors of provinces. The Hindu Code of Manu, translated into Burmese, served as a body of laws; decrees were often issued by the king; but custom played the most important part in the legal system. The insignia of royalty were the white elephant and white umbrella. There was no hereditary nobility, but rank was conferred by office, and its various degrees were indicated by the different shades of garment, furniture, or utensils, and especially by the color of umbrellas. The extortion of officials frequently drove the villagers to assassination; the common term for "the people" was "the poor," and the popular category of the five enemies were Fire, Water, Robbers, Rulers, and Ill-wishers. The governors and deputies who acted as judges heard cases in an open shed in a public place, but every cause was presented in the first instance at the official's house, to which none could come empty-handed. The village elders constituted the ultimate tribunal of

government, and they were consulted by the officers on all matters affecting the people. British Burma became a chief commissionership of British India in 1862 and a lieutenant governorship in 1897. The lieutenant governor is assisted by a legislative council at Rangoon. In addition to the eight divisions are the specially administered territories of the Northern Shan States, Southern Shan States, Pakokku Hill Tracts, and Chin Hills; also, to the north of Upper Burma, the Kachin Tracts. In each of the eight divisions is a commissioner, who is the chief judicial and executive officer. Each division is again subdivided into districts, townships, and village communities, in which Burman magistrates preside. The headmen of the village still retain local police and revenue powers, and each village has its judicial commissioner and recorder. The police force is made up of natives and Indians, under the command of European officers. There are 37 districts in Burma proper, about 500 magistrates under salary, and 125 native honorary magistrates. The chief revenue sources are the tax on land (amounting to over 40 per cent of the total), the poll tax (4 rupees per head), customs, forests, opium and salt monopolies, and the income tax. In 1910-11 the revenues and expenditures of Burma were Rs. 8, 78, 93, 378 and Rs. 5, 45, 71, 398, respectively.

The largest cities are Rangoon and Mandalay, with 293,316 and 138,299 inhabitants, respectively, in 1911.

Population. In 1901 the inhabitants of Burma, mostly native, numbered 10,490,624, the increase being over 26 per cent since 1891; the population in 1911 was 12,115,217, showing an increase of 1,624,593 in the last decade. Of the total in 1911, 420,777 were Mohammedans. The original Burman tribes are believed to have descended southward from Tibet not much before 600 B.C. The tribe of Mramma, or Burma, settled on the northern Irrawaddy, where they came into contact with the Nunkhmer race. Haddon (*Races of Man*, 1909, p. 68) thinks that the original population of Burma may be represented by the primitive Selung of the Mergui Archipelago, whom he considers Indonesian by a proto-Malay mixture. The Burmans are Mongoloid, with a suggestion of the Aryan, with flat faces and broad skulls, black hair, rich brown skin, and brilliant black eyes. They are usually well-formed, medium-statured, thickset, the men being fond of athletics. They wear a simple dress, consisting of *paso* and *tamcin*, the former for men, 10 yards long and a half yard wide, which is hitched round the loins and disposed in various ways over the body, making a dress without buttons or strings, but with pockets and infinite capacities. The woman's garment, only $4\frac{1}{2}$ feet long, is of cotton, silk, or calico. The white cotton coat is common to both sexes. The old costume seems now to be giving way to a new tartan-like dress or garment, about 9 or 10 feet long. On their heads they usually wear a knot of their own hair or bright-colored silk kerchiefs. They are very fond of personal decorations, and the native jewelers are expert at gold and silver work. The smoking of tobacco and the chewing of betel nut are almost universal. The houses, usually set on piles, on account of river floods, are made of bamboo, laid on timber framework, and covered with the leaves of the palm, or by other suitable vegetable leaf and fibre. The Bur-

mese are fairly industrious, but the women excel the men in variety of domestic employments. They are temperate and hearty, but not fond of continued labor. The number of festivals is very great, and they are enthusiastically kept and enjoyed by the people at large. Among the amusements may be mentioned boxing matches, pony, bullock, and boat races, cockfighting, "splitting the coconut," chess, dominoes, and various sorts of juggling, snake charming, etc. The Burman is excessively fond of pageants and frolics. In theatrical representations, as a rule, the hero and heroine are prince and princess, the countryman is a jester or clown, and the king's officers are courtiers or executioners. The king is consistently idealized, while his deputies are travestied. The ballet is very gay and animated, the dancers dressing in superb costumes. The entertainment often lasts several days or nights in succession, and it may consist of dialogues, music, and interludes of dancing and posturing.

Other races besides the Burmans proper dwell within the limits of Burma; the Shans inhabit the eastern highlands, where they have semi-independent states, and the Kachins the northern. The Karens, in many respects an interesting people, are the most important hill race of the country and best exemplify the mode of life of the aboriginal tribes, who have been kept out of the plain lands by the more powerful Burmans. Those living in the mountains between Burma and Siam get their living by making forest clearings, on which they raise one crop, removing to another site every season. Those settled in the lowlands are more civilized and speak and dress like Burmans. Noted for their hospitality, truthfulness, chastity, and spirit of equality, they are nevertheless given to drunkenness and to superstition. They are shorter and stouter than the Burmans and of much fairer complexion. They employ elephants and are good hunters, and do not marry until reaching mature life.

The language of the Burmese belongs to the same group as the speech of the Annamese, Siamese, and others speaking the so-called monosyllabic tongues. The alphabet seems to be a rounded form of Pāli. The forms of speech tend to preserve relative ideas in the same categories as the terms expressing the ideas. The root remains unaltered; thus, instead of our herb, shrub, tree, the Burman speaks of grain plants, creeper plants, timber plants. Written Burmese literature goes back for over 800 years, and it is everywhere colored by Hindu influences.

Religion. The Burmese are the practical Buddhists of the world, their religion being of the Southern (Ceylonese) or purer variety, which most closely approximates the original form taught by Gautama. Even the Siamese are lax in comparison to the Burmese. Burma, isolated geographically between the mountains and the ocean, has remained, since the fifth century, thoroughly imbued with Buddhism. It has been their great teacher and civilizer, stimulating the growth of a folklore and a national literature. It has prevented caste and has covered the settled part of the country with temples, shrines, and monasteries, the latter being well organized. Theoretically every boy in the country, while at the temple school, becomes a monk, though he is not bound by vows to remain. Tolerant and free from fanaticism, as well as from blood feuds, the Burmans show the

blessings of the gentle teachings of the purer Buddhism. In sacred edifices the country is very rich; the tope, dagoba, or shrine is a solid mass of brickwork, shaped like a bell and crowned by an umbrella-like open ironwork. The temples contain many images of the Enlightened One, or Gautama, the Buddha of history; and the people never tire of plastering these images over with gold leaf. The temples bristle on the sides and top with pointed projections which are usually gilded. The most famous temple in the country is in Pagan, a city founded 100 A.D. It flourished about 1000 A.D. and later fell into decay, its ruins covering nearly 8 square miles. A tremendous expense was incurred in temple building. At every shrine great bells are hung by metal clasps of rich design. At Mingum, near Mandalay, the bell, cast in 1790, weighs 88 tons. It is 17 feet in diameter, and the metal is 18 inches thick. The monastery buildings have roofs of several diminishing stages, elaborately adorned, but the special feature of Burman architecture is the pointed arch, used not only for doors and windows, but also in the vaulted coverings of passages. The ancient temples of Pagan consisted almost entirely of brick corridors, one within the other, with vaulted tent roofs, of masonry springing from the outer or lower wall to the inner or higher. Among the non-Buddhist tribes, spirit, nature, or demon worship prevails, in more or less degrading form.

For recent anthropological and ethnological information on the Burmans, consult: Kelly, *Burma* (1908); O'Connor, *Mandalay and Other Cities of the Past in Burma* (1907); Phayre, *History of Burma* (1884); San Germano, *The Burmese Empire a Hundred Years Ago* (ed. Jardine, 1893); also the *British Gazetteer of Burma* and the publications of the *Indian Census*.

History. The early history of Burma is mythical and obscure. As is the case with many ether peoples, the legendary accounts, preserved in old chronicles of the country, seem to point to an early immigration of the dominant race. It is supposed that the ancestors of the modern Burmese came from the Indian Highlands, on the northwest, at a period from 2000 to 2500 years ago; entered the valley of the Irrawaddy, the great river highway along which the whole history of Burma has been enacted; conquered the Mongoloid peoples then inhabiting the country, and gradually built up a new state. Tagaung, on the Upper Irrawaddy, the ruins of which still remain, is reputed to have been founded about 800 B.C.

In the eleventh century A.D. Pagan, in central Burma, was the seat of power; its kings consolidated the country and conquered the land of Pegu on the south. The power of Pagan declined through the decadence of its rulers, received a fatal blow from the assault of the Mongols in the time of Kublai Khan, and came to an end in 1279. A Shan dynasty ruled for 65 years. The fourteenth century saw the rise of the power of the rulers of Ava, the new centre of the kingdom, and the beginning of the long rivalry between Ava, the northern kingdom, and Pegu, in the south. The chronicles of the kings of Ava claim for them descent from early Buddhist rulers in India, even going back to Gautama himself. The power of Ava reached its zenith in the fifteenth century, when the history of the country becomes clearer through

the accounts of Portuguese and other European traders, who entered the country and described its conditions. The supremacy passed temporarily from the Burmans to a line of kings from the Shan tribes on the Siamese border; but toward the close of the sixteenth century the southern Kingdom of Pegu became dominant over all Burma. The Peguan supremacy continued until c.1751, but during the last century of this period there was a steady decline of the Burmese power. The French and English, meanwhile, secured a foothold in the Irrawaddy delta. In 1754 Alaung Payá, or Alompra, the energetic warrior chief of a village of Ava, headed a rising, overthrew the dominion of Pegu, and reorganized the Burmese Empire. He founded Rangoon (1755), the commercial centre of Burma. Troubles began in his reign with the English East India Company, which had established a factory in Burmese territory. Alompra died in 1760 during an invasion of Siam. The dynasty which he founded degenerated rapidly through intermarriage among its members. With one exception, Mindon Min (1852-78), the successors of Alompra were bloodthirsty and tyrannical. Consult Nisbet, *Burma under British Rule and Before* (2 vols., London, 1901).

In 1795, in consequence of the violation of British territory by a Burmese force in pursuit of certain rebels, troubles arose, which were, however, quieted for a time. Difficulties over trading privileges followed, and frontier disputes occurred, culminating in 1824 in a collision between armed forces of the East India government and of Burma, on the Assam frontier. War was declared, and British forces at once invaded Burma. The common error of British campaigns, that of despising an unknown foe, led to failures at the beginning, but ultimately the Burmese were pressed so hard that a treaty was made at Yandabo, Feb. 24, 1826, by which Burma renounced its claim on Assam and ceded to the British government Arakan and the coast of Tenasserim, including Martaban, east of the Salwin River. Their defeat was a great blow to the national pride of the Burmese. King Tharawaddy, who obtained the throne in 1837 by the deposition of his brother, declared the Treaty of Yandabo void and treated English envoys with studied contempt until in 1840 relations between the British and Burmese governments ceased altogether. The extreme development in Tharawaddy and his son, Pagan Min, of the homicidal mania, which was the curse of the line of Alompra, led to a revolt which in 1853 seated the brother of Pagan Min, Mindon Min, on the throne. At the same time the intolerable treatment of English citizens had brought on the second war between Great Britain and Burma. In the spring of 1852 a British force captured Martaban and Rangoon, and the Peguans took the part of the British against the Burmese. In January, 1853, Pegu was proclaimed a part of the British Empire, which thus obtained control of the Burmese coast and of the mouths of Burma's three navigable rivers. Mindon Min proved to be a wise and just ruler. Diplomatic relations were resumed in 1867 between Burma and Great Britain, and a commercial treaty was made. Two years before, a superstition had caused the abandonment of the capital, Amaraapura, for the new city Mandalay. Mindon Min died in 1878, and the principal queen, having no sons, married one of her daughters, Supayah Lat, to Theebaw, one

of the youngest of the late king's sons. The other princes were seized and executed. Theebaw, arrogant, cruel, and weak, was a tool of his sanguinary queen, who put all her rivals to death. The disorder resulting from the tyranny of their rule affected British trade and led to new troubles with Great Britain; while an effort was made to establish a favorable connection with France. Trouble between the Burmese government and the Bombay-Burma Company, which held a concession in the teak forests, presented an excuse for British intervention, which seemed necessary to prevent French influence from becoming paramount. The British invaded Burma, and on Nov. 28, 1885, occupied Mandalay. The King and Queen were made captive and taken to Madras; all of Burma passed into British control, and in 1886 the annexation of Upper Burma to the dominions of the Queen-Empress Victoria was formally proclaimed. For several years there was much lawlessness, chiefly in the form of brigandage by the *dacoits*, or robbers, but by 1895 the country was practically pacified. It is incorporated as a province of the Indian Empire under a lieutenant governor. An agreement was concluded with France on Jan. 15, 1896, making the Mekong River the boundary between the Shan States of Burma and French Indo-China. This boundary agreement gave France some territory east of the Upper Mekong, which formerly belonged to Burma. The development of railroads in Burma has now begun. The connection of Shanghai with India by way of the Upper Yangtse valley and Upper Burma is claimed by some students of the far eastern situation to be essential to the maintenance of Great Britain's position in the East. Four years later the Chinese boundary was determined upon and the demarcation of Burma's territory completed. In the twentieth century little has taken place in the country aside from the building of railroads. The social and political unrest which marked the rest of India during this period largely passed over Burma. But progress in the province, if slow, has been steady. In 1913 steps were taken toward founding a Burmese university.

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Colquhoun deal with the railway and frontier problems affecting Burma. An account of missionary activity will be found in Wayland, *Life of Adoniram Judson* (Boston and London, 1853); Ireland, *The Province of Burma* (New York, 1907).

BURMANN, būr'mán, PETER, THE ELDER (1668-1741). A Dutch classical scholar. He was born in Utrecht and studied law at the universities of Utrecht and Leyden, taking his degree as doctor of laws in 1688. After practicing as an advocate for some years, he was appointed professor of history and rhetoric (1696) and later became professor of Greek in Utrecht. In 1715 he removed to the University of Leyden. His chief works are editions of Latin classics—Petronius, Velleius Paterculus, Quintilian, Valerius Flaccus, Phædrus, Ovid, the *Poëtæ Minores*, Justin, Suetonius, Lucan, Horace, and Vergil. They are characterized less by critical acumen than by learning and fullness. He published also, besides minor works on Roman taxes and Roman antiquities in general, *Sylloge Epistolarum a Viris Illustribus Scriptorum*, in 5 vols., a work of permanent value for the history of scholarship in the Netherlands.

BUR-MARIGOLD. A popular name of the widely distributed genus *Bidens*, of the family Compositæ. This genus includes about 75 species of annual and perennial plants, among which, in America, are the weeds called "beggar-ticks," "Spanish needles," and "sticktight." Some species have very showy flowers, one of the finest in cultivation being the *Bidens grandiflora*, a native of South America. The name *Bidens* is descriptive of the bidentate top of the seed-like fruit (*achene*).

BURMEISTER, būr'mis-tēr, HERMANN (1807-92). A German naturalist, born in Stralsund. He studied medicine and natural history at Halle, and in 1837 became professor of zoölogy there. In 1848 he was a deputy to the German National Assembly and afterward was a representative in the Prussian First Chamber. In 1850 he traversed part of Brazil in the interest of science and visited other parts of South America a few years later, becoming in 1861 director of the National Museum at Buenos Aires, where he died. He published many elaborate works on zoölogy, among them *Handbuch der Entomologie* (1832-55), *Grundriss der Naturgeschichte* (1833; 10th ed., 1868), *Zoologischer Handatlas* (1835-43), *Geschichte der Schöpfung* (1843; 7th ed., 1867), *Systematische Uebersicht der Tiere Brasiliens* (1854-56), and *Physikalische Beschreibung der Argentinischen Republik* (1875).

BURMEISTER, RICHARD (1860-). A German-American pianist and composer, born in Hamburg. He studied under Liszt in 1881-84, made concert tours through Europe in 1883-85, and from 1885 to 1897 was the head of the piano department of the Peabody Institute in Baltimore. From 1897 to 1899 he was director of the Scharwenka Conservatory of New York City. In 1903 he became head of the piano department of the Royal Conservatory at Dresden. Since 1907 he has been living in Berlin. Among his compositions the best known is a concerto in D m. for piano and orchestra. He also arranged for orchestra a number of the piano compositions of Liszt and reorchestrated Chopin's piano concerto in F minor.

BURMESE (būr-mēz' or -mēs') **WARE** (first imported from Burma). Small cups and other

vessels, made of strips of bamboo woven like fine basketwork, with the interstices filled with paste made of wood oil and fine powders. When sufficiently hardened, the surface is smoothed with pumice stone and water.

BURMESTER, *bour-me-stër*, **WILLY** (1869-). A German violinist, born in Hamburg. He was a pupil of his father, and from 1882-85 of Joachim. For a year (1890) he was connected with the Conservatory at Sondershausen. He is regarded as among the greatest living violinists. He edited a series of classic masterpieces for the violin.

BURNABY, **FREDERICK GUSTAVUS** (1842-85). An English traveler and soldier. He was born in Bedford, England, and was educated at Harrow and in Germany. Early in his life he displayed his fondness for adventure. He entered the army in 1859 and by 1881 had command of his regiment, but he spent much of his time in travel, going first to Central and South America. He was military correspondent for the *London Times* with Don Carlos in Spain and was sent to join Gordon in the Sudan. In 1875 he undertook his famous ride to Khiva, making his way, unaided and alone, to the heart of Asia, notwithstanding the Oriental laws and the efforts of the Russians to intercept him. In 1876-77 he rode on horseback through Asia Minor and from Scutari to Batum. In 1880 he contested unsuccessfully, in the Conservative interest, the Birmingham seat in Parliament. He took part in the Egyptian campaign, and was killed in an engagement with the Mahdi's troops in January, 1885. Two of his books, in which he describes his exploits, had large sales: *A Ride to Khiva* (1876) and *On Horseback through Asia Minor* (1877). They are marked by strong anti-Russian sentiments. Consult Mann's *Life of Burnaby* (London, 1892), and Wright, *The Life of Colonel Fred Burnaby* (London, 1908).

BURNAND, **SIR FRANCIS COWLEY** (1836-1917). An English writer. He was educated at Eton and Cambridge and was called to the bar in 1861. His success as a writer of burlesque led him to adopt literature as a profession. He produced a great number of dramatic pieces, among which *Ivion* and the burlesque of Jerrold's *Black-Eyed Susan* had remarkable runs. He became one of the leading contributors to *Punch*, in 1880 succeeded Tom Taylor as its editor, and held that position until 1906, when he retired. From its pages he collected several volumes, including *Happy Thoughts* (1870), *More Happy Thoughts* (1871), *Happy Thought Hall* (1872), *Quite at Home* (1890), *Records and Reminiscences* (1904). He became editor of the *Catholic Who's Who* and the *Catholic Year Book* in 1912.

BURNE-JONES, **SIR EDWARD COLEY, BART.** (1833-98). An English painter. He was born in Birmingham, Aug. 28, 1833. Intended for the Church, he entered Exeter College, Oxford, on the same day as his lifelong friend, William Morris. Their common devotion to art led them to the study of Ruskin, the works of the Pre-Raphaelites, and finally, during Easter, 1856, to their removal from Oxford to London. There they studied under the inspiring direction of Rossetti, lived and worked together until Morris's marriage in 1859. Burne-Jones's first visit to Italy occurred in 1859, his marriage to Georgiana McDonald in 1860. The young couple visited Italy with John Ruskin in 1862 and in 1865 moved from London to "The Grange," Fulham,

the former home of the poet Richardson. Burne-Jones's earliest works, of which the drawings of Sidonia von Bork and Clara von Bork (1860) are good examples, are remarkably effective, reflecting the influence of Rossetti. His earliest paintings were aquarelles, exhibited at the Society of Painters in Water Colors. Excellent examples are the "Wine of Circe," "Love among the Roses," "Dies Domini," and "Spring, Summer, Autumn, and Winter." He first became known to the general public in 1877 at the opening of the Grosvenor Gallery, where his "Days of Creation," "Beguiling of Merlin," and "Mirror of Venus" created a great sensation. In all the following exhibitions of the Grosvenor Gallery and its successor, the New Gallery, his works formed the centre of attraction. In 1878 he exhibited "Laus Veneris," "Chant d'Amour," "Pan and Psyche." Other important works are "The Golden Stairs" (1880), "The Wheel of Fortune" (1883, National Gallery), "King Cophetua and the Beggar Maid" (1884, Tate Gallery), the "Pygmalion" series (1887, Birmingham Gallery), and the "Garden of Pan" (1887). In 1885 he was elected associate of the Royal Academy, at which he exhibited the following year his remarkable "Depths of the Sea"; but he resigned his membership in 1893. His most famous later works are the "Briar Rose" series, four illustrations from the fairy story *The Sleeping Beauty* (1890), and the large tempera "Star of Bethlehem" (1891, Birmingham Gallery). During the following years he painted most of his portraits. He received numerous foreign distinctions, including the cross of the Legion of Honor, was honorary D.C.L. of Oxford, and, at the suggestion of Gladstone, was made a baronet in 1894. He succumbed unexpectedly to an attack of influenza in London, June 17, 1898.

Although not an original member of the Pre-Raphaelite Brotherhood, Burne-Jones may properly be classed with this group of painters. (See PRE-RAPHAELITES.) He shared their romantic and ideal spirit, but was less insistent upon detail and was a better colorist. An essentially Celtic spirit in British art, his pictures deal with a far-away world of romance, and appeal only to a limited public, which has made a veritable cult of his art. They are literary in character, but highly decorative; sometimes deficient in line, but always good in color. He has often been compared, with some reason, to Botticelli. The best collection of his works is in the Birmingham Museum, which, besides the paintings mentioned above, contains many drawings and designs for stained glasses. A book of highly interesting drawings for pictures never executed was left by him to the British Museum, which also purchased his *Book of Flowers*.

Mention should also be made of his high rank as a decorative designer. His designs for stained glasses, executed for the most part by the firm of William Morris & Co., are to be found throughout England. Among his Gobelins the best known is the "Adoration of the Magi" in Exeter College, Oxford. One of his favorite designs was the "Tree of Life," a mosaic in the American Church at Rome. His illustrations, though not numerous, are excellent. The most important are the 87 for the edition of Chaucer (1897), the finest production of Morris's Kelmscott Press.

Bibliography. A full account of his life, with selections from his characteristic letters, was written by Lady Burne-Jones, *Memorial of*

Edvard Burne-Jones (London, 1904). His life and works have also been described in the monographs of Bell (ib., 1892), Cartwright (ib., 1894), Von Schleinitz (Bielefeld, 1901). Consult also Vallance, *The Decorative Art of Edvard Burne-Jones* (London, 1900), and Baylis, *Five Great Painters of the Victorian Era* (ib., 1902).

BURNÉ-JONES, SIR PHILIP (1861-1926). An English figure and portrait painter, son of Sir Edward C. Burne-Jones. He was a pupil of his father, and his works are highly imaginative in character. The best known are the "Vampire" after Kipling's poem (1897); "Earth rise to the Moon"; and the "Madonna of the Future" after Henry James's story. His more recent works are portraits, of which the finest are those of his father before an easel (1898); Sir G. F. Watts modeling a statue (1900, Museum of Johannesburg); "Rudyard Kipling in his Study" (1900); "Lord Rayleigh" and "Sir Walter Gilbey" (1910). He published *Dollars and Democracy* (1904).

BURNELL, ARTHUR COKE (1840-82). An English Sanskrit scholar, born in St. Briavels, Gloucestershire. He studied at Bedford and King's colleges, and from 1860 to 1880 was connected with the civil administration of India. Everywhere he bought or copied Sanskrit manuscripts, 350 of which he presented in 1869 to the India Library. For the Madras government he compiled what is, perhaps, his greatest work, a *Classified Index to the Sanskrit MSS. in the Palace at Tanjore* (1880). He was versed in Sanskrit and the dialects of Southern India, and also knew something of Javanese, Coptic, and Tibetan. His *South Indian Palaeography* (1874, 2d ed., 1878) has been characterized by Prof. F. Max-Müller as "indispensable to every student of Indian literature." In his *Ordinances of Manu* (1891) and other similar works, he was especially successful in grouping and elucidating the essential principles of Hindu law. With Sir H. Yule he originated the *Hobson-Jobson* glossary of Anglo-Indian colloquial words and phrases. A bibliography of his Sanskrit works is contained in the Jaiminiya text of the *Arsheyābrahmana of the Sāma Veda* (1878). He returned to England in 1881 and died there the following year.

BURNES, SIR ALEXANDER (1805-41). A British officer and traveler. He was born in Montrose, Scotland, and belonged to the same family as Robert Burns, the poet. He early entered the Indian army, and through his knowledge of Oriental languages gained rapid promotion. After undertaking several important missions for the Indian government he was sent to explore the countries bordering on the Oxus and the Caspian. For greater safety he adopted the dress and usage of the Afghans. On his return to England he was highly honored by the Royal Geographical Society and other associations and was lionized generally. In 1839, having previously been knighted and promoted to the rank of lieutenant colonel, he was appointed political resident at Kabul, where he was murdered on the breaking out of the insurrection in that city. He published *Travels into Bokhara* (2d ed., 1829).

BURNET (OF. *brunete*; cf. ML. *burneta*, springwort). The name applied to species of two genera of Rosaceæ—*Sanguisorba* and *Poterium*, now combined in *Sanguisorba*. The great burnet (*Sanguisorba officinalis*) is common in meadows in all parts of Europe, particularly

where the soil is calcareous. It has a stem 1 to 2 feet high, pinnate leaves, with about four pairs of ovate-serrated leaflets and an odd one; the flowers are crowded in dark-red spikes. In Germany it is grown as a forage crop for cattle. The root is astringent and was formerly used in medicine. The common or lesser burnet (*Sanguisorba minor*, formerly called *Poterium sanguisorba*) grows on dry, calcareous soils in England and in central and southern Europe. It much resembles the great burnet, but the leaflets are smaller, and the reddish-green flowers are arranged in dense heads on long furrowed stalks. It is very resistant to drouth and cold, and its culture for forage has been recommended on dry, calcareous soils. Although it forms a great part of the natural pasture of the South Downs and other sheep-raising districts of England, it is not generally regarded as a very valuable forage plant. It is sometimes cultivated in gardens for its slightly astringent leaves, which are used for flavoring soups and salads. This plant has been introduced into North America and grows wild in the northeastern part of the United States. Both this and the preceding are perennial plants. There are several other species, both of *Sanguisorba* and *Poterium*, some of the latter shrubby, natives chiefly of the warmer temperate parts of the world. *Sanguisorba canadense* is found in the northeastern United States.

BURNET, GILBERT (1643-1715). A British prelate and historian. He was born in Edinburgh, Sept. 18, 1643, the youngest son of Lord Crimond. At the age of 10 he entered Marischal College, Aberdeen, being admitted M.A. at the age of 14. He inclined to the study of civil and feudal law, but at his father's wish applied himself to divinity, and at 18 was ordained. In 1663 he made a six months' stay in Oxford and Cambridge, visited London, and next year journeyed through Holland and France, in Amsterdam perfecting himself, under a learned rabbi, in the Hebrew language. In 1665 he became minister of Saltoun; in 1669, professor of divinity in Glasgow University, but resigned in 1674, having incurred the enmity of his patron Lauderdale by mixing in the polemics of the time. He removed to London and was made preacher of the Rolls Chapel and lecturer at St. Clement's. In 1676 he published his *Memoirs of the Dukes of Hamilton*, and in 1679 the first volume of his *History of the Reformation*, for which he received a vote of thanks from Parliament. Next year appeared *Some Passages in the Life and Death of the Earl of Rochester*, in which Burnet records the religious interviews which led to that profligate nobleman's conversion to Christianity. In 1681 he published the second volume of his *History of the Reformation* and in 1682 his *Life of Sir Matthew Hale*. Renewed efforts were made to induce him to break with the Liberal party and to attach himself to the King. He was offered the bishopric of Chichester, but refused it, and in 1683 narrowly escaped trouble in connection with the Rye House Plot. He conducted the defense and attended the execution and vindicated the memory of his friend Lord William Russell. The King retaliated by depriving Burnet of his St. Clement's lectureship. On the succession of James II he went to the Continent, and traveled through France, Italy, Switzerland, and Germany. In 1684 he was introduced to the Prince of Orange and, when William went to England, accompanied him as royal chaplain, shortly after being ap-

pointed Bishop of Salisbury. He entered on his duties with ardor, but his first pastoral letter, in which he based the right of William to the throne on conquest, gave offense to Parliament, and they ordered it to be burned by the common hangman. William, who knew the excellent qualities of the Bishop, was not impressed by this solemn performance and continued to trust Burnet to the end of his life. In 1698 Burnet was appointed preceptor of the Duke of Gloucester and in 1699 published his exposition of the Thirty-nine Articles, which was condemned as heterodox by the House of Lords. In 1814 appeared the third volume of his *History of the Reformation*. He died of pleurisy in London, March 17, 1715. Soon after his death appeared Bishop Burnet's *History of My Own Time, from the Restoration of King Charles II to the Conclusion of the Treaty of Peace at Utrecht, in the Reign of Queen Anne*. It was sarcastically but foolishly abused by Swift, Pope, Arbuthnot, and other Tory writers of the day. Burnet was a Broad Churchman and was a man of almost puritanic virtue. He was distinguished by charity, geniality, and moderation. His style is neither elegant nor correct, and his judgment not always reliable; but honest simplicity and vigor, as well as fullness of detail, make his works valuable to the student of history. The best edition of Burnet's *History of My Own Time* is that of M. S. Routh (6 vols., Oxford, 1833). A volume of notes, written from time to time by Burnet and used in the preparation of his *History*, has been published by Miss H. C. Foxcroft (Oxford, 1902). It is valuable in showing the changes of Burnet's opinion in the course of some 20 years. The best edition of the *History of the Reformation* is by Pocock (7 vols., Oxford, 1865). Consult Clarke and Foxcroft, *Life of Gilbert Burnet* (Oxford, 1907).

BURNET, JACOB (1770-1853). An American jurist, prominent in the early history of Cincinnati, Ohio. He was born in Newark, N. J., graduated at Princeton in 1791, studied law under Judge Boudinot, and was admitted to the New Jersey bar in 1796. In the same year he removed to Cincinnati, then a straggling village, and from that time until his death was closely identified with public affairs in both city and State. He was a member of the Legislative Council of the Territory of Ohio from 1799 to 1802, was elected to the State Assembly in 1812, was one of the supreme judges of Ohio from 1821 to 1828, and from 1828 to 1831 was a member of the United States Senate. It was largely through his influence that the people in the Middle West were relieved, in 1821, of part of their heavy debt to the national government for public lands, and in 1830 he took an active part in securing legislation which made possible the completion of the Miami Canal. For more than 50 years he was a leader in nearly all the public enterprises undertaken in Cincinnati. He helped establish the Lancasterian Academy there; was one of the founders of the Cincinnati College, of which he was also first president; was president for several years of the Ohio Medical College and of the Cincinnati Colonization Society; and for some time was at the head of the Cincinnati branch of the United States Bank. He published *Notes on the Early Settlement of the Northwestern Territory* (1847), a work which contains much interesting information and has been of value to subsequent writers on the history of the Northwest and especially of Ohio.

BURNET, JOHN (1863-). A Scottish scholar, born in Edinburgh. He studied at the University of Edinburgh and at Balliol College, Oxford, and in 1888 became an instructor at Harrow School. In 1890 he was appointed a fellow of Merton College, Cambridge, and in 1892 professor of Greek in St. Andrews University. He published scholarly works on *Early Greek Philosophy* (1892; 2d ed., 1908), a most excellent treatise, following in general the lines of Zeller's *Philosophie der Griechen* (1876); *Greek Rudiments* (1897); *The Ethics of Aristotle* (1899); *Aristotle on Education* (1903). He edited *Platonis Opera* (5 vols., 1899-1907) and Plato's *Phædo* (1911).

BURNET, THOMAS (c.1635-1715). An English writer. He was born in Yorkshire, was educated at Cambridge, and in 1685 was elected Master of the Charterhouse. Later he succeeded Archbishop Tillotson as chaplain in ordinary and clerk of the closet to William III. His *Telluris Theoria Sacra*, of which the first part appeared in Latin in 1681 and in English three years later, is an ingenious work, though its science was crude even for those times. The work was completed in 1689. In 1692 Burnet published his *Archæologia Philosophicæ, sive Doctrina Antiqua de Rerum Originibus* (also in English), which displayed great learning; but as it treated the Mosaic account of the fall as an allegory, and in particular burlesqued the conversation between Eve and the serpent, it gave great offense. His style, in both Latin and English, is dignified and often eloquent; but his speculations, once solemnly praised for their profundity, are now interesting only as a study in the history of philosophy or for their colossal absurdities. Two of his works, *De Fide et Officiis Christianorum* and *De Statu Mortuorum et Resurgentium*, were published posthumously (in 1720). Consult R. Heathcote, *Life of Dr. Burnet*, in the 7th ed. of *Telluris Theoria Sacra* (1759).

BURNET, WILLIAM (1688-1729). An American Colonial Governor, born at The Hague, Holland, the son of Bishop Gilbert Burnet. He was appointed Governor of New York and New Jersey in 1720, and immediately began to take an active interest in the competition between France and England for the control of the Indian trade. In 1722 he established, at Oswego, the first British trading post on the Great Lakes, and five years later, in spite of the vigorous protests of the French Governor of Canada, Beauharnais, and the niggardly support of the New York Assembly, built here a fort, which served to divert much of the Indian trade from the French post at Niagara and later played a prominent part in the French and Indian wars. In 1722, also, Burnet summoned to Albany, N. Y., the Governors or representatives of several other Colonies and persuaded them to unite with him in threatening war against the Eastern Indians, in case they did not agree to a satisfactory treaty with the English. He soon aroused the opposition of the traders and many others in the Colony, however, by his rigid enforcement of an act prohibiting the sale to French traders of goods commonly used in the Indian trade. In 1728 he exchanged the Governorship of New York and New Jersey for that of Massachusetts and New Hampshire, but in this latter position almost immediately became embroiled with the Massachusetts Assembly over the old question of the payment of a fixed salary to the Governor, the Assembly stubbornly insisting on its right to raise at its own

discretion all money needed for the administration of the Colony. In this matter Burnet merely acted under the explicit instructions of the home government, the House of Commons having passed a resolution that the contention of Massachusetts tended "to shake off the dependency of the said Colony upon their kingdom"; but the Assembly remained obdurate, and Burnet was never able to carry his point.

Though obstinate and headstrong and frequently without tact, Burnet was an honest and capable administrator and sincerely desired to promote the welfare of the Colonies over which he presided. He deserves especial praise for his far-sighted Indian policy in New York, which did much to further the interests of England in the long and stubborn contest with France for commercial and territorial supremacy in the Northwest. Consult Nelson, *William Burnet* (New York, 1892).

BURNET, WILLIAM (1730-91). An American surgeon, conspicuous in the early history of New Jersey. He was born in Newark and was educated at the College of New Jersey (afterward Princeton University). Having studied medicine he took up its practice in New York, but on the approach of the American Revolution he participated in the various patriotic movements in New Jersey, became chairman of the Committee of Safety in Newark, was surgeon-general in the army, and served in the Continental Congress as delegate from New Jersey in 1780-81. After the latter year he resumed the practice of medicine and surgery. He was one of the founders of the Society of the Cincinnati.

BURNETT, FRANCES ELIZA HODGSON (1849-1924). An American author. She was born in Manchester, England, came to the United States at the close of the Civil War, and lived in Tennessee until her marriage (1873) to Dr. S. M. Burnett. She has since lived in Washington and Europe. She first gained notice by "Surly Tim's Trouble," in *Scribner's Magazine* (1872), and her reputation was firmly established by *That Lass o' Lowrie's* (1877), a remarkable story of life in the English mining districts. The most noteworthy of her later novels are *Haworth's* (1879) and *A Lady of Quality* (1896), both dealing with English life; *Louisiana* (1880); *A Fair Barbarian* (1881); *Through One Administration* (1883); *Editha's Burglar* (1888); and *In Connection with the De Willoughby Claim* (1899). Her most successful book, *Little Lord Fauntleroy* (1886), is an Anglo-American story and has been dramatized by its author. She also wrote a play, *Esmeralda* (1881), with W. H. Gillette, founded on one of her short stories; and dramatized, in collaboration with Dr. Townsend, *A Lady of Quality*. Divorced from Dr. Burnett in 1898, she afterward married Dr. Stephen Townsend (1900). Her later works include: *The Making of a Marchioness* (1901); *The Little Unfair Princess* (1902); *A Little Princess* (1905); *The Cozy Lion* (1907); *The Shuttle* (1907); *The Good Wolf* (1908); *The Dauch of a Tomorrow* (1909); *The Secret Garden* (1909; last reprint, 1913); *T. Tembarom* (1913). Among her plays are, in addition to those mentioned, *Phyllis*, and *Niwie* (with Stephen Townsend).

BURNETT, JAMES. See MONBODDO, JAMES BURNETT.

BURNETT, PETER HARDEMAN (1807-95). The first civil Governor of California. He was born in Nashville, Tenn., but early removed to Missouri and afterward emigrated to Oregon,

where he took a prominent part in the organization of its territorial government and served two terms in the Legislature. In 1848 he accompanied one of the first companies of gold seekers to California. Here he soon attracted attention by urging the organization of a civil government for the State without awaiting congressional authority. Immediately after the adoption of the new constitution he was elected Governor, but resigned in 1851 and was afterward judge of the Supreme Court (1857-58) and president of the Pacific Bank of San Francisco (1863-80). He published: *The Path Which Led a Protestant Lawyer to the Catholic Church* (1860); *The American Theory of Government Considered with Reference to the Present Crisis* (1861); *Recollections of an Old Pioneer* (1878); *Reasons Why We Should Believe in God, Love God, and Obey God* (1884).

BURNETT PRIZES, THE. Two prizes in theology founded by John Burnett, of Dens, Aberdeenshire. This gentleman, who was born in Aberdeen in 1729 and died there in 1784, was a general merchant in Aberdeen and for many years during his lifetime spent £300 annually on the poor. On his death he bequeathed the fortune he had made to found the above prizes, as well as for the establishment of funds to relieve poor persons and pauper lunatics, for inoculation, and to support a jail chaplain, in Aberdeen. He directed the prize fund to be accumulated for 40 years at a time, and the prizes (not less than £1200 and £400) to be awarded to the authors of the two best treatises on "The evidence that there is a Being all-powerful, wise, and good, by whom everything exists; and particularly to obviate difficulties regarding the wisdom and goodness of the Deity; and this independent of written revelation, and of the revelation of the Lord Jesus; and from the whole to point out the inferences most necessary and useful to mankind." The first prize was awarded in 1815 to William Laurence Brown, and the second to John Bird Sumner, in 1848 Archbishop of Canterbury; in 1855 the first to Robert A. Thomson, and the second to John Tulloch, in 1860 principal of St. Andrews, and the essays were published. The fund was in 1883 applied to the foundation of a lectureship on natural theology in the University of Aberdeen.

BURNETT SALMON. A local name in Queensland for the Australian lungfish (*Ceratodus fosteri*). See BARRAMUNDA.

BURNEY, CHARLES (1726-1814). An English composer, well known as the author of a *General History of Music*. He was born in Shrewsbury. Having studied music in his native city, in Chester, and under Dr. Arne in London, he began to give lessons in music. After composing incidental music to three dramas—*Robin Hood*, *Alfred*, and *Queen Mab*—for Drury Lane, Burney left London and settled as organist at Lynn, in Norfolk, where he planned his work on the *History of Music*. In 1770-72 he traveled in France, Italy, the Netherlands, and Germany, collected materials for his projected work, and published an essay on the *Present State of Music in France and Italy*, etc. (1772); *The Present State of Music in Germany, the Netherlands and United Provinces*, etc. (1773). This was followed by his *General History of Music from the Earliest Ages to the Present Period* (4 vols., 1776-89). It has retained a good deal of its value, especially in the early parts of the work treating of the music of the ancients. Besides some minor

works Burney wrote a memoir of Handel and nearly all the musical articles in *Rees's Cyclopædia*. He was appointed organist at the hospital in Chelsea in 1789. He died in Chelsea. He was intimately acquainted with many of the most eminent men of his time, including Edmund Burke and Dr. Johnson. His second daughter was the famous writer Frances Burney (afterward Madame D'Arblay).

BURNEY, FRANCES. See D'ARBLAY, FRANCES.

BURNHAM, DANIEL HUDSON (1846-1912). A distinguished American architect, born in Henderson, N. Y., and educated in Chicago and under tutors at Waltham, Mass. His architectural training was obtained in various offices in Chicago. At the age of 26 he formed a partnership with John W. Root, a designer of refined taste and imagination. To them was intrusted the general planning of the Columbian Exposition at Chicago (1893), Mr. Burnham, after the death in 1891 of his partner, being joined by C. B. Atwood, under the firm name D. H. Burnham & Co. The splendid generalship displayed by Mr. Burnham as director of works of the exposition, as well as the professional skill and taste evidenced by particular undertakings of his firm, gave him an international reputation and a remarkable influence on the architects of his time. He became the recipient of many distinctions from institutions and organizations at home and abroad; in 1894 he was president of the American Institute of Architects. Besides designing and erecting important public and commercial buildings, such as the "Rookery" offices, Great Northern Hotel, Masonic Temple, and Railway Exchange (all in Chicago), the "Flat-Iron" building in New York, the Pittsburgh Pennsylvania Railroad Station, the Union Passenger Station in Washington, and other buildings in Buffalo, Cleveland, and San Francisco, he gained fame as a city planner. He was chairman of the national commission for the beautifying of Washington, D. C., collaborating with Messrs. McKim, Olmsted, and Saint-Gaudens, headed the Civic Centre Committee at Cleveland, and prepared plans for the rebuilding of San Francisco and Baltimore and for a comprehensive improvement (in progress, 1913) of Chicago. He died June 1, 1912.

BURNHAM, FREDERICK RUSSELL (1861-). An American explorer, born at Tivoli, Minn. He lived for several years in the Far West as cowboy, scout, and miner, went in 1893 to South Africa, where he distinguished himself as a scout in the first and second Matabele wars, and for several years after 1898 operated gold mines in the Klondike and Alaska. During the Boer War he served as chief of scouts under Lord Roberts, later was commissioned major in the British army, and by King Edward VII was created a member of the Distinguished Service Order. In 1902-04 he conducted exploring expeditions in Africa, and then, exploring various parts of Central America, made important archaeological discoveries relating to Maya civilization. With John Hays Hammond (q.v.) he engaged in diverting the entire Yaqui River through a system of canals into a 700-square-mile delta. This enterprise was in progress in 1913.

BURNHAM, HENRY EBEN (1844-1917). An American legislator, born at Dunbarton, N. H., and a graduate of Dartmouth College. He was admitted to the bar, served in the New Hampshire House of Representatives for one term, was judge of probate, chairman of the

Republic State Convention in 1888, and a delegate to the New Hampshire Constitutional Convention in 1889. In 1893 he was appointed ballot law commissioner of the State. He was elected a United States Senator in 1901 and was re-elected for the term 1907-13. He was not again a candidate in 1912.

BURNHAM, SHELBURNE WESLEY (1838-1921). An American astronomer, born at Thetford, Vt., and educated at the academy there. A stenographer by profession, he became interested in astronomy and soon had made many important discoveries in double stars. In 1877 he became associated with the Chicago Observatory, then with the Lick, and finally accepted the chair of practical astronomy at the University of Chicago. In 1894 he was made a fellow of the Royal Astronomical Society and was awarded a gold medal for having recorded 1274 new double stars. His general catalogue of stars which he discovered was issued in 1900 as vol. i of the Publications of the Yerkes Observatory. The Paris Academy of Sciences awarded him the Lalande prize in astronomy in 1904. He published *A General Catalogue of Double Stars within 121° of the North Pole* (1906) and *Measures of Proper Motion Stars* (1913).

BURNHAM BEECHES. The remains of an ancient forest in Buckinghamshire, England, 25 miles northeast of London, noted for its immense beech trees. The poet Gray, early in the eighteenth century, aroused interest in this wild and picturesque tract. In 1879 the London corporation purchased the surrounding 374 acres and in 1883 set them apart for public use. Consult Heath, *Burnham Beeches* (London, 1880).

BURNING BUSH. See SPINDLE TREE.

BURNLEY (the *Brun* or *Burn* river + *ley*, *lea*, AS. *leah*, meadow, field). A thriving town and parliamentary and county borough in Lancashire, England, at the junction of the Brun and Calder rivers, and on the Leeds and Liverpool Canal, 29 miles north of Manchester (Map: England, D 3). The town was incorporated in 1861 and made a county borough in 1888. It owes its prosperity and rapid growth to the development of the textile industry. It has factories for the weaving, spinning, and printing of cotton. Other industries include iron founding, coal making, quarrying, and the manufacture of sanitary wares and bricks. The town owns its water works, gas works, electric lighting plant, and electric railways, public markets, and slaughterhouses, all of which yield a substantial income. A fine technical school was opened in 1909. In 1887 it bought out the sewage works and added a profitable sewage plant in 1889. The city provides public baths, a sanatorium, and the Victoria Hospital. Pop., 1861, 29,000; 1891, 87,000; 1901, 97,000; 1911, 106,337.

BURNNOOSE, būr-nōōs', or **BURNOUS** (Ar. *burnus*, *burnūs*, a hooded cloak, whence Fr. *burnous*, Ger. *Burnus*, Russ. *burnus*, *burnuz*). The name of a garment worn in parts of North Africa. It is a large woolen mantle, worn above the other attire of the natives, and having a hood, which is thrown over the head in rainy weather. The burnoose is generally white, though distinguished individuals wear it of various colors. It has been long in use among the Spaniards under the name of *albornoz*. Through the conquest of Algeria by the French, the burnoose was imported into France and England, although its original form has been considerably altered.

BURNOUF, bur'noof', EMILE LOUIS (1821-1907). A French Orientalist, cousin of Eugène Burnouf. He was born in Valognes, France, Aug. 25, 1821; lectured for a time in Nancy, on ancient literature, and subsequently was director of the French school in Athens. Among his works are *Méthode pour étudier la langue sanskrite* (1859, 3d ed., Paris, 1885); *Essai sur le Vêda* (Paris, 1863); *Dictionnaire classique sanskrit-français* (1863-65), the first work of its kind to appear in France; *Histoire de la littérature grecque* (2 vols., 1869); *La ville et l'Acropole d'Athènes aux diverses époques* (Paris, 1877); *La mythologie des Japonais, d'après le Koku-si-Ryakel*, the first translation of its work into an European tongue (1875); *Le catholicisme contemporain* (1879); *Mémoires sur l'antiquité* (Paris, 1879).

BURNOUF, EUGÈNE (1801-52). A French Orientalist, one of the most distinguished of modern times. He was born in Paris, Aug. 12, 1801, and, after entering on the study of law, devoted himself to the Oriental languages, especially those of India and Persia. In conjunction with Professor Lassen of Bonn, he published, in 1826, the first work to appear on Pāli, the language of about half of the Buddhist peoples, entitled *Essai sur le Pāli*, which was followed, in 1827, by *Observations grammaticales sur quelques passages de l'essai sur le Pāli*. His great aim, however, at this time was to obtain a complete knowledge of the remains of the language and religious literature of the Avesta (q.v.), which had been neglected since the time of Anquetil-Duperron, or, at least, not philologically and critically examined. Burnouf undertook to decipher those curious manuscripts which Anquetil-Duperron had brought home with him and which lay unregarded in the Bibliothèque Impériale. He commenced by causing the *Fendidad-Sadé* to be lithographed with great care and published from time to time in the *Journal Asiatique* (1830). In 1832 he became a member of the Academy of Inscriptions and in the same year succeeded Chézy as professor of Sanskrit in the Collège de France. In 1834 he published the first volume of his *Commentaires sur le Fagha, l'un des livres religieux des Parses*, a work which for the first time rendered possible a knowledge not only of the dogmas, but also of the language of Zoroaster. It is a masterpiece of conscientious industry and scholarly acumen for the time, but too comprehensive in its scope to allow the work ever to be completed. His studies in the Avestan language induced him to make an attempt to decipher the cuneiform inscriptions of Persepolis, in his *Mémoire sur deux inscriptions cunéiformes* (Paris, 1836). From 1840 to 1849 he began to issue the text along with a translation of the *Bhāgavatā-Purāna*, a system of Indian mythology and tradition. Burnouf only published three volumes of this immense work, which was afterward continued by Hauvette-Besnault and Bergaigne. As the fruit of his study of the Sanskrit books of the Buddhists, he published in 1844 the *Introduction à l'histoire du Bouddhisme indien*, of which the second volume, entitled *Le Lotus de la Bonne Loi* (1852), was in press at the time of the author's death. (See **BUDDHISM**.) This great work absorbed for six years the whole energies of Burnouf, who was now the recognized successor of Silvestre de Sacy. He died May 28, 1852, a few days after being elected perpetual secretary of the Academy of Inscriptions. Consult Lenormant, *Eugène Burnouf* (Paris, 1852);

Barthélemy-Saint-Hilaire, *Notice sur les travaux de M. E. B.* in the 2d ed. of the *Introduction à l'histoire du Bouddhisme* (1876); *Choix de Lettres d'Eugène Burnouf* (1891).

BURNOUF, JEAN LOUIS (1775-1844). A French classical scholar, born at Urville (Manche). In 1807 he became an assistant professor at the Collège Charlemagne and in 1816 professor of eloquence (Latin). From 1840 he was librarian of the university. He did much to promote classical studies in France, in particular through his *Méthode pour étudier la langue grecque* (1814; 1893). He also prepared an excellent translation of Tacitus (6 vols., 1827-33; 1881).

BURNS, ANTHONY (c.1830-62). A celebrated fugitive slave. He escaped from slavery late in 1853, but was arrested in Boston on May 24, 1854, under the provisions of the Fugitive Slave Law of 1850, and, pending a trial, was confined in the Boston Courthouse. News of his arrest spread rapidly and the people of Boston, already indignant over the passage of the Kansas-Nebraska Bill (q.v.), were quickly aroused to a high pitch of excitement. On the evening of the 26th a great crowd met in mass meeting at Faneuil Hall and listened to fiery addresses by Wendell Phillips and Theodore Parker, but soon adjourned, amid scenes of great excitement, to help forward a premature effort at rescue then being made by a small party under Thomas W. Higginson (q.v.). The attempt completely failed, however, after one of the marshal's posse had been killed and a number of the rescuing party had been more or less severely injured, and on June 2 Burns was formally adjudged to his owner by the United States Commissioner. Under the escort of a strong guard he was taken through State Street and placed on board a United States revenue cutter, the houses along the line of march being draped in deep mourning and flags being everywhere placed at half-mast. Burns's freedom was procured in the following year with money collected by a colored preacher of Boston. He subsequently studied at Oberlin, and for several years was pastor of a church in St. Catharines, Canada. He was "the last fugitive slave ever seized on the soil of Massachusetts." Consult: C. E. Stevens, *Anthony Burns: A History* (Boston, 1856), and interesting accounts in T. W. Higginson, *Cheerful Yesterdays* (Boston, 1898), and C. F. Adams, Jr., *Richard Henry Dana, A Biography* (Boston, 1891).

BURNS, RT. HON. JOHN (1858-). An English labor leader, born in Vauxhall, London. From 1868 he was apprenticed to various trades, finally to engineering at Millbank, and for a year was a foreman engineer in West Africa. By his platform oratory, and as an official of the Amalgamated Engineers' Association, he became well known as a labor representative. He was arrested in 1886 on the charge of exciting a mob to violence, but was acquitted. He defended the right of public meeting in Trafalgar Square in 1887 and was imprisoned for six weeks for resisting the police. In 1885 he was defeated as Socialist candidate for Parliament for West Nottingham and in 1889 was a member of the committee which effected a settlement in the London dock strikes. He was a member of the London County Council, in 1892 was returned to Parliament for Battersea and was reelected in 1895, 1900, and 1906. Becoming President of the Local Government Board in

the Campbell-Bannerman ministry, formed in December, 1905, he retained his office when Asquith became Premier three years later. His acceptance of a seat in this ministry offended some of the more radical elements and to a certain extent lessened his prestige as a labor leader. He received the degree of LL.D. from Liverpool and Aberdeen universities. His writings include: *The Unemployed* (1893); *Municipal Socialism* (1902); *Labour and Drink* (1904); *Labour and Free Trade* (1904).

BURNS, ROBERT (1759-96). The great lyric poet of Scotland. He was born at Alloway, in Ayrshire, Jan. 25, 1759. His father, then a nursery gardener and afterward the occupant of a small farm, had to struggle all his life with poverty and misfortune, but made every exertion to give his children a good education; and the boy was able to enjoy a considerable amount of instruction and miscellaneous reading in spite of his poverty. Among the books placed in his way were the *Spectator*, Locke's *Essay*, and Pope's *Iliad*. He learned French and some Latin; and he knew Allan Ramsay and the popular songs of Scotland. In his seventeenth year he wrote his first poem, addressed to Nelly Kilpatrick, by whose side he had worked in the fields. In 1777 he was sent to study surveying in the house of his uncle, Samuel Brown, at Ballochneil. Here he fell into the company of some "jovial smugglers" and began to realize the force of the traditional association of wine, woman, and song. His father was now trying another farm at Lochlea, near Tarbolton, to which the young poet returned, probably feeling himself not a little of a man of the world. In 1780 he was one of the founders of a "Bachelor's Club" at Tarbolton, at whose meetings such weighty topics as the relative merits of love and friendship were gravely discussed. The love affairs which have provoked so much ethical controversy continually beset him. The generally lax morality of the Scotch peasantry at the period may partly account for, if not excuse, his failings in this direction. He was for a while seriously smitten by the charms of a farmer's daughter named Ellison Begbie, who is supposed to be the original of his Mary Morison; but she prudently declined an alliance, and in the summer of 1781 he went to Irvine to join a relative of his mother's in a flax-dressing business; but a convivial celebration of the next new year's advent ended in the burning down of the shop. Returning to Lochlea, he lived quietly and temperately after this reverse; and after his father's death, in 1784, he and his brother Gilbert settled on a small farm, which they had taken in the previous autumn at Mossiel, near Mauchline. Here he became acquainted with several educated men and wrote some of his best-known poems, such as "The Jolly Beggars," "The Cottar's Saturday Night," and the lines "To a Mouse." He had already begun to think of publication, his brother having assured him that his "Epistle to Davie" would "bear being printed," when the perplexing consequences of his love affair with Jean Armour (to whom he had given, under pressure, a written certificate that she was his wife, but who had been induced to repudiate him) determined him to emigrate. He accordingly published a volume of poems in July, 1786, with a view to making his passage money to Jamaica. Meantime, from May to October of the same year (while still

able to protest on June 6 that he loved Jean to distraction), he developed a passionate attachment to Mary Campbell, who died of a fever, and was commemorated by some of his most pathetic poems, "To Mary in Heaven" and "Highland Mary." The success of his little volume and negotiations for a second edition decided him to stay in Scotland, and finally in November drew him to Edinburgh. Here he was received with enthusiasm in good society, and made a favorable impression by the "dignified plainness and simplicity" of which Scott, who then saw him, speaks. From the second edition of his poems (April, 1787) he received in the end about £500. While waiting for payment he traveled agreeably in various company and renewed his old relations with Jean Armour, to whom he was legally married in August, 1788. Before this, in March, he had been appointed to a place in the excise and had taken the lease of a farm at Ellisland, near Dumfries. The farm not paying too well, Burns took up his duties as exciseman and discharged them vigorously, though not with excessive sternness. Here he wrote "Tam o' Shanter" in a single day for Grose, the antiquarian, in whose *Antiquities of Scotland* (1791) it was first published. In December, 1791, having given up his farm, he settled in Dumfries on a salary of £70 a year. Some unguarded political expressions drew upon him the suspicion of the government, and he came near losing his post. Possibly embittered by what he felt to be injustice, he allowed his habits of dissipation to grow on him, to the detriment of both his reputation and his health. All the while, however, his poetical activity continued, though he indignantly refused offers of a regular salary for contributions to the *London Star* and *Morning Chronicle*. Broken in health and spirits, he died July 21, 1796.

Burns was of about the average height and of heavy build, with features inclined to coarseness. According to Scott, the portraits (of which the most trustworthy is that by Nasmyth, 1787) have unduly refined them. His face became singularly animated and expressive in conversation, and numerous observers have commented on the extraordinary glow of his fine eyes. "I never saw such another eye," says Scott, "in any human head." His character has perhaps been sufficiently indicated above; but if regrettably weak in certain directions, it had very noble elements—an honorable pride, a sense of duty towards his relatives, and a real desire to act a manly and not a heartless part. His poetry was nearly always written on the spur of the moment—the response of the feelings to the immediate circumstances. Its charm and power lie in the justness of the feelings expressed and in the truthfulness and freshness which it derives direct from life. Seldom have such manliness, tenderness, and passion been united as in the songs of Burns. He is weak only when, acting on bad advice, like David in Saul's armor, he tries to write in the conventional English instead of the simple, natural Scottish dialect. He had no slight influence in preparing the way for that outburst of the natural in English poetry, whose epoch-making date, the publication of the *Lyrical Ballads*, falls only two years after his death. (See LYRIC POETRY; ROMANTICISM.) The hundredth anniversaries of his birth and death were celebrated with immense enthusiasm, not only

in Scotland, but throughout the English-speaking world.

For editions of Burns, consult: Chambers, with Life and Letters, revised by Wallace (4 vols., Edinburgh, 1896); Douglas, with Life and estimate by Nichol (7 vols., Edinburgh, 1896); Henley and Henderson, centenary edition (4 vols., Edinburgh, 1896-97); and for his life, Lockhart (latest edition, Edinburgh, 1890); Shairp, in *English Men of Letters Series* (London, 1879); Angellier, *Robert Burns, sa vie et ses œuvres* (Paris, 1893); Lord Rosebery, *Robert Burns* (Edinburgh, 1896). R. Chambers published an expurgated edition of Burns (often reprinted) with some valuable *personalia*. Consult also: Angus, *Printed Works of Robert Burns* (1899), containing a list of some 930 items; Wallace (editor), *Correspondence between Burns and Mrs. Dunlop* (London, 1898); Carlyle, "Burns" in his *Essays* (London, 1847); Stevenson, "Robert Burns," in *Familiar Studies of Men and Books* (London, 1882); McKie, *Bibliography of Burns* (Kilmarnock, 1881); T. F. Henderson, *Robert Burns* (New York, 1904); Craigie, *A Primer of Burns* (1896); and Dougall, *The Burns Country* (New York, 1911).

BURNS, WILLIAM CHALMERS (1815-68). A Scottish Protestant missionary to China. He was born at Dun, Forfarshire; was educated in Aberdeen, practiced law, then became a minister in 1839. He carried on extensive revivals in Great Britain, Ireland, and Canada, but in 1846 went out as a Presbyterian missionary to China. He adopted Chinese dress and lived like a native. He had much facility in acquiring the spoken language and labored with great enthusiasm in many places. In this way he became widely known. Everywhere he commended himself by his faith, piety, courage, and unselfishness, and is still held in loving remembrance. Consult Burns, *Memoir of William Chalmers Burns* (New York, 1870).

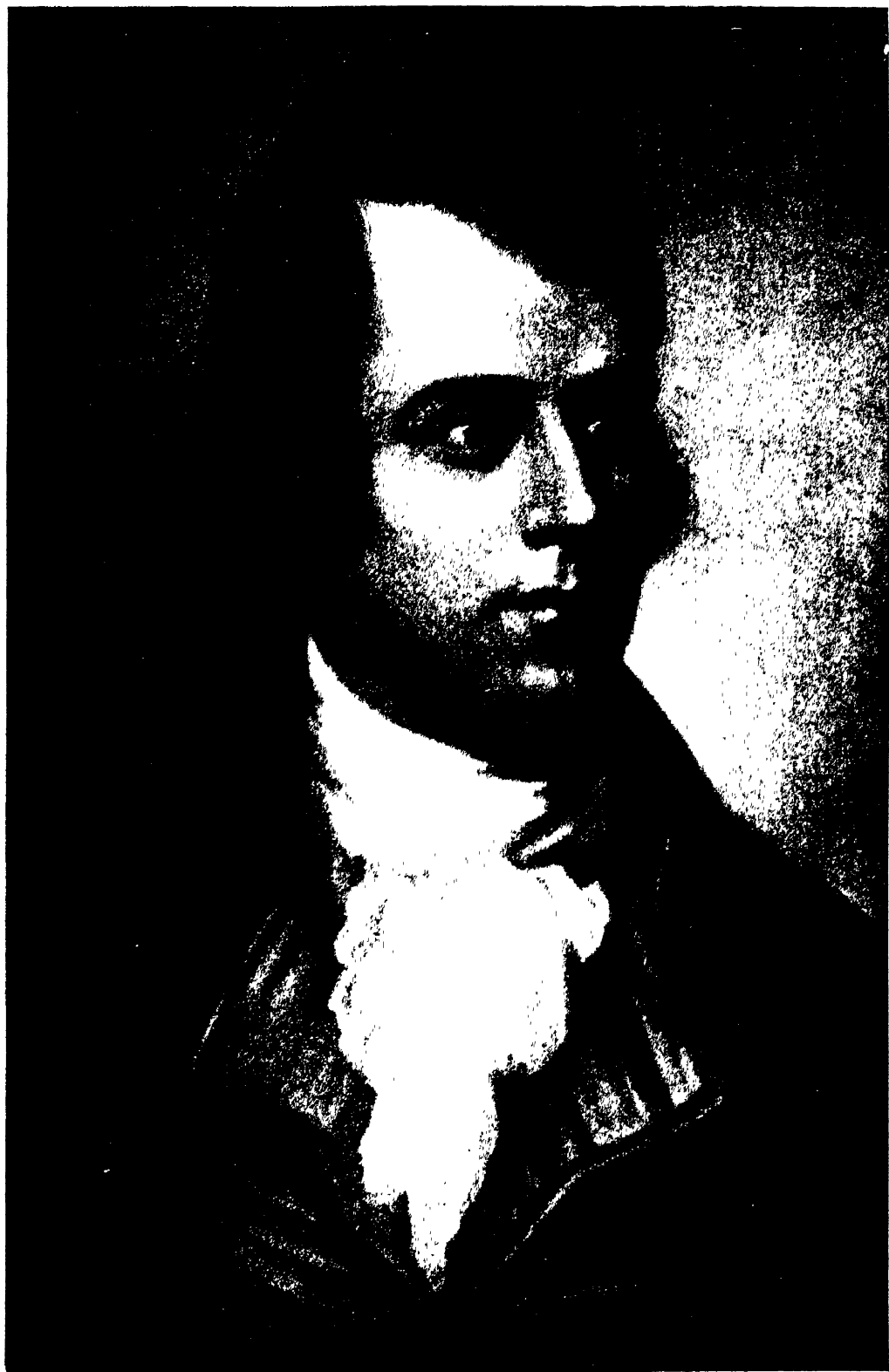
BURNS, WILLIAM JOHN (1861-). An American detective, born in Baltimore, Md., and educated at parochial and public schools and at a business college. He became a detective in 1885, entered the Secret Service in 1890, gradually rising until in charge of the Far West. He was transferred to Washington, D. C., in 1894. Thereafter he was engaged in almost every important case which the United States government prosecuted. His best-known case is that against the McNamara brothers for dynamiting the Los Angeles Times building on Oct. 1, 1910. Others which he brought to a successful conclusion are the Jacobs case of counterfeiting revenue stamps, the Taylor and Bredell cases of counterfeiting in 1899, the government land-frauds case which involved Senator Mitchell, and the Schmitz-Ruef case in San Francisco. He published *The Masked War* (1913).

BURNS, WILLIAM WALLACE (1825-92). An American soldier. He was born in Coshocton, Ohio, and in 1847 graduated at West Point. He served in the war with Mexico and was in the field with the Army of the Potomac from 1861 to 1863, during which time he attained the rank of major general of volunteers. Later he became chief commissary of the Department of the Northwest and during the last part of the war was chief commissary of the Department of the South. He received the brevet of brigadier general in 1865 and was on duty in the Commissary Department at Washington until 1889,

when he retired, with the regular rank of colonel.

BURNS AND SCALDS. A burn is an injury to the body produced by heat or corrosive substances. A scald is an injury produced by a heated liquid or vapor. Practically three degrees of burns are recognized by surgeons: (1) burns resulting in a simple reddening of the skin; (2) burns characterized by the formation of vesicles or blebs; (3) burns resulting in sloughing and the formation of a scar, including all gradations of severity, from partial destruction of the true skin to incineration of skin, muscle, and bone. Symptoms: pain and shock, to be relieved by opiates and stimulants. If the denuded surface be large, the patient may suffer from cold, in addition, to be combated with voluminous dressings and artificial heat from bottles and hot enemata. Burns of the first degree should immediately be bathed with a saturated solution of bicarbonate of soda, or covered with an antiseptic ointment. Second-degree burns should be dusted with an antiseptic drying powder, such as a mixture of zinc oxide and boric acid, after puncturing the blebs. Burns of the third degree have to be treated as open wounds, and measures are chiefly directed towards securing the separation of sloughs and the prevention of suppuration. Contracting scars often result, causing deformity. To obviate this result, skin grafting and splints so adjusted as to secure surface extension are employed. Later plastic operations may relieve deformities. (See AUTOPLASTY.) The extent of surface affected determines in part the danger of a burn. Death may follow injury to a third of the surface of the body; it is quite certain to follow injury to one-half the surface. Children bear burns very badly, and burns about their faces or necks are more dangerous than those of similar extent in other regions.

BURNSIDE, AMBROSE EVERETT (1824-81). An eminent American soldier, prominent on the Federal side during the Civil War. He was born in Liberty, Ind.; attended a village school, and at 17 was indentured to a merchant tailor; but soon afterward was appointed to the United States Military Academy, where he graduated in 1847. He then spent some years in garrison duty, but later resigned from the service, and from 1853 until 1858 was a manufacturer of firearms at Bristol, R. I., inventing the Burnside breech-loading rifle in 1856. On the outbreak of the Civil War he entered the Federal army, and from May to August, 1861, was colonel of Rhode Island volunteers, participating as such in the first battle of Bull Run. He became brigadier general of volunteers on August 6, was engaged in organizing the "Coast Division" of the Army of the Potomac from October, 1861, to January, 1862, and commanded the Department of North Carolina from January to July of this year, during which time he captured Roanoke Island, occupied Newbern, N. C., and forced the surrender of Fort Macon, Beaufort. On March 18, 1862, he was raised to the rank of major general of volunteers. He was then placed in command of the reinforcements intended for the Army of the Potomac, which later constituted the Ninth Army Corps, and in July was offered, but emphatically refused, the chief command of the Army of Virginia. After the second battle of Bull Run he was again offered the chief command, the Army of Virginia now being merged into the



ROBERT BURNS
FROM THE PAINTING BY P. KRÄMER

Army of the Potomac; but he again declined it, and served under McClellan as commander of the Ninth Corps, in the Maryland campaign against Lee, participating in the battle of South Mountain, and commanding the left wing in the battle of Antietam on September 17. (See ANTIETAM, BATTLE OF.) Though still feeling that he was unqualified for the position, he was finally—on November 10—placed in command of the Army of the Potomac, and conducted the campaign against Lee, which virtually ended with the overwhelming defeat of the Federals at Fredericksburg on December 13. Burnside attacked on this occasion with foolhardy recklessness and, in general, proved unequal to the task assigned to him. (See FREDERICKSBURG, BATTLE OF.) On Jan. 26, 1863, he was replaced by Hooker, and from March to December he was in command of the Department of the Ohio, during which time he captured Cumberland Gap, marched into East Tennessee, and occupied Knoxville, where for some time he was besieged by the Confederate General Longstreet. On April 13 he issued his famous "General Order No. 38," directed against the "Copperheads" in his department, and especially against Vallandigham, who was soon afterward arrested, convicted, and imprisoned. (See VALLANDIGHAM, CLEMENT L.) This order, together with his "General Order No. 84," which prohibited the circulation of the *New York World* and suppressed the *Chicago Times*, aroused the most violent opposition as striking at the freedom of speech and of the press, and President Lincoln yielded to the popular demand so far as to rescind that part of the latter order which suppressed the *Times*. From May to August, 1864, Burnside served under Grant, as commander of the Ninth Corps in the Richmond Campaign, taking part in all the important battles during that time and having charge of the mine operations at Petersburg. For his conduct on this latter occasion he was subsequently censured by a court of inquiry after a prolonged investigation found him, along with several other officers, "answerable for the want of success." Many military critics, however, have since contended that Burnside was not really at fault, and that the responsibility for the fiasco should be placed elsewhere. On April 15, 1865, Burnside resigned from the service and subsequently was prominent as a projector and manager of railroads. He was Governor of Rhode Island from 1866 to 1869, and from 1875 until his death was a member of the United States Senate. In 1870 he visited Europe, and during the siege of Paris acted as a medium of communication between the French and the Germans. As a soldier he rendered valuable services in the capacity of corps commander, but proved unable to cope with the problems and difficulties which fall to the lot of a commanding general. Consult Poore, *Life and Public Services of Ambrose E. Burnside* (Providence, 1882) and Woodbury, *Major-General Burnside and the Ninth Army Corps* (Providence, 1867).

BURNTISLAND, bûrnt'î'land. A seaport of Fifehire, Scotland, on the north shore of the Firth of Forth, about 8 miles north-northwest of Edinburgh (Map: Scotland, E 3). Burntisland is an important station of the North British Railway, having a steamboat ferry connecting it with Granton, the station on the opposite side of the Forth. It has a commodious harbor, which was greatly improved in 1876.

Its industries consist principally of distilling, fisheries, shipbuilding, and the shipping of coal and iron. In summer it is much frequented as a watering place. Together with Kinghorn, Dysart, and Kirkcaldy it sends one member to Parliament. Pop., 1891, 4692; 1901, 4846; 1911, 4708.

BURNT SIENNA, sî-ên'nâ. A fine orange-red pigment, transparent and permanent, used in both oil and water-color painting. It is obtained by simply burning the ferruginous ochreous earth known as Terra di Sienna. Excellent greens are produced by mixing it with Prussian blue. It mixes well with other pigments generally, dries quickly, and is most valuable in warming and enriching shadows.

BURNT STONES. A variety of carnelian usually found in ruins. They have a dull appearance externally, but exhibit a beautiful red color when held up to the light. This peculiar effect is supposed to have been produced by fire, and has been imitated by burning the upper surface of the gem with a hot iron. They were formerly highly prized, especially if handsomely cut.

BURNT UMBER. A pigment of a russet-brown color. It is semitransparent, mixes well with most other pigments, and dries quickly. It is obtained by burning umber, an ochreous earth containing manganese, and deriving its name from the place where it was first discovered—Umbria, in Italy.

BUR OAK. See OAK.

BURR, AARON (1716-57). An American clergyman and educator. He was born in Fairfield, Conn., and graduated at Yale in 1735. Two years later he became pastor of the Presbyterian Church in Newark, N. J. In 1748, after considerable experience in the schools of Newark as teacher and principal, he became second president of the College of New Jersey, now Princeton University. As his predecessor, Jonathan Dickinson, was president only a few months, Dr. Burr, in his administration of nine years, really laid the foundations of the college. He was a thorough scholar and an eloquent preacher. His wife was the daughter of Jonathan Edwards, while he was the father of Aaron Burr (1756-1836). Dr. Burr published a Latin grammar known as *The Newark Grammar* (1752), and *The Supreme Divinity of Our Lord Jesus Christ* (new ed., 1791).

BURR, AARON (1756-1836). An American politician, Vice President of the United States from 1801 to 1805. He was born in Newark, N. J., Feb. 6, 1756, and was the son of the Rev. Aaron Burr, and grandson of Jonathan Edwards, the famous theologian. His paternal grandfather, according to Hildreth, was a German who had settled originally at Fairfield, Conn. His father died in 1757 and his mother in the following year, and he, with his sister, was brought up by his maternal uncle, the Rev. Timothy Edwards, at Elizabethtown, N. J. He graduated at Princeton in 1772, studied theology under the Rev. Dr. Bellamy, of Bethlehem, Conn., and then (1774) studied law with Tappan Reeve, his brother-in-law, in Litchfield, Conn. He entered the Continental army in 1775, soon after the battle of Bunker Hill; took part in Benedict Arnold's Canadian expedition; became in turn a member of Washington's military family (April, 1776), and an aid to General Putnam (June, 1776); served with distinction as lieutenant colonel at Hackensack and Monmouth (q.v.), where he commanded a bri-

gade; was placed in command of the American lines in Westchester County (N. Y.)—in the so-called Neutral Ground—in January, 1779; and in March of this year resigned from the service. He was involved in the opposition to Washington, and at the time of the more serious friction sided with Lee and Gates. (See CONWAY CABAL, THE.) In 1782 he began the practice of the law in Albany, N. Y. In July of the same year he married Mrs. Theodosia Prevost, the widow of a British officer who had died in the West Indies, and in the following year their only child, Theodosia, was born in New York. (See BURR, THEODOSIA.) In 1833 Burr, then in his seventy-eighth year, married Madame Jumel, the widow of a French merchant, who had an estate in the northern part of Manhattan Island and who possessed some property. Much of this property was soon spent by Burr, and the couple separated, but were never divorced.

Burr definitely established his home in the city of New York, in December, 1783, soon after his first marriage, and his political activity and advancement there soon became marked. He was a member of the State Assembly in 1784-85 and again in 1797-99 and 1800-01; was Attorney-General of the State in 1789-91; was a member of the United States Senate from 1791 to 1797; and in 1801, just before becoming Vice President, was chairman of the Constitutional Convention of New York. In 1792 he declined a nomination to the Supreme Court of New York. He was an early, zealous, and unscrupulous leader among the Republicans (afterward Democrats), and the especial rival of Alexander Hamilton, the prominent leader of the Federalists. In the presidential struggle of 1800 John Adams (then President), Thomas Jefferson, Charles C. Pinckney, and Burr were the candidates, and the votes for Jefferson and Burr, the two Republican candidates, were equal—73 for each. As the Constitution then provided, the person having the largest number of electoral votes was to be President, and the person having the next largest number was to be Vice President. The equal division threw the election into the House of Representatives, where each State had one vote only, the vote of a majority of all the States being necessary for a choice. After a week of balloting Jefferson was chosen President, and Burr therefore became Vice President. He was charged, unjustly, it seems, with having exerted himself to defeat Jefferson, who was the regular presidential candidate of his party, and his alleged intrigues to this end ruined him politically as a Republican. In 1804, however, he ran as an independent candidate for Governor of New York and received the support of some of the Federalists, but was defeated by Morgan Lewis. For this Burr blamed Hamilton, who had undoubtedly used all of his influence against him, both on this occasion and in 1801, and these disappointments and failures, added to the intensely bitter character of the partisan warfare of the time, led to a duel, at Weehawken, N. J., on July 11, 1804, in which Hamilton, who discharged his weapon into the air, was killed by Burr. In the spring of 1805 Burr started for the western part of the country, bent, probably, among other things, upon the conquest of Mexico and the establishment there of a separate government, with himself as chief. It was in the course of these operations that he brought ruin upon his friend Harman Blennerhassett (q.v.). In 1806

President Jefferson was informed, in part, of Burr's schemes by General Wilkinson, in whom Burr had partially confided, and Burr was soon arrested at Frankfort, Ky. He was defended by Henry Clay and was acquitted after an exciting trial. He was again arrested at Natchez, in January, 1807, but was released by the Grand Jury, and on February 19, in Alabama, he was a third time arrested. After a long and memorable trial at Richmond, Va., first on a charge of treason and then on a charge of misdemeanor, he was again acquitted; and in June, 1808, sailed for Europe to raise means for prosecuting his schemes. Four years of effort in England, Sweden, Germany, and France resulted in nothing but failure, and in 1812 he returned in extreme poverty and opened a law office in New York; but his course had alienated the people, and he met with only moderate success.

Henry Adams, after showing how Burr had "endeavored by the foul means of a Federal alliance to acquire the presidency," goes on to say, with a vehemence which is really partisan, that "a more gross betrayal of confidence could hardly be conceived, even in political life. He had made it clear that his heart was set upon personal aggrandizement and not upon a Republican success. His untrustworthiness appeared the more despicable by comparison with the strictly honorable conduct of Jefferson, who might have excused endeavors on his own behalf upon the plausible ground that he was only forwarding the avowed will of the party. The antipathy with which many persons had long since learned to regard Burr now became the sentiment of all honest and intelligent men in the nation." Schouler, after referring to the brilliant and captivating manners of Burr, describes him as "one whose restless and romantic ambition was the more dangerous because of his utter want of conscience and generosity. He was socially well connected and had, like Hamilton, won a fair military reputation in the war for a young officer, gaining on its close later distinction as an advocate at the New York bar, where these two were professional competitors under an act which disqualified all Tory practitioners." Hildreth thus sums up the closing years of his life: "Arriving in New York, he found himself, in his old age, and still harassed by his creditors, obliged to resume the practice of the law for support. The death of his only daughter, lost at sea on a voyage from Charleston to meet him, left him without family ties. Yet, amid all this loneliness and embarrassment, his remarkable equanimity did not desert him, and he lived 24 years longer, shrouding himself with that mystery and obscurity which he so much affected, and dying at last (1836) after surviving almost all his contemporaries, at the age of 80—a remarkable example of the mutability of political fortune." He died, Sept. 14, 1836, at Port Richmond, on Staten Island, N. Y., and his body was placed with his father's in the burying ground at Princeton. Consult: Parton, *Life and Times of Aaron Burr* (New York, 1858); Davis, *Memoirs of Aaron Burr* (2 vols., New York, 1836); the interesting *Private Journals of Aaron Burr during his Residence in Europe* (2 vols., New York, 1838), edited by Davis; and the brief sketch by Merwin, "Aaron Burr" (Boston, 1899), one of the *Beacon Biographies*; W. F. McCaleb, *The Aaron Burr Conspiracy: a History Largely from Original and Hitherto Unused Sources* (New York,

1903); S. P. Orth, *Five American Politicians: A. Burr* (Cleveland, 1906); Adams, *History of the United States* (9 vols., New York, 1889-91); also Schouler, *History of the United States of America under the Constitution* (6 vols., last ed., New York, 1899). For a strongly favorable view of Burr's life and character, consult Todd, *The True Aaron Burr* (New York, 1902), and for a bibliography virtually complete to date of publication, consult Tompkins, *Burr Bibliography* (Brooklyn, 1892). Of these the two best authorities are Adams and McCaleb, who have practically reconstructed the older views in regard to Burr's schemes.

BURR, ENOCH FITCH, D.D., LL.D. (1818-1907). An American Congregational divine. He was born at Westport, Conn., Oct. 21, 1818; graduated at Yale College, 1839, and became pastor at Lyme, Conn., 1850. He was a popular lecturer on the scientific evidences of religion. Of his numerous publications, all of which sold widely, may be mentioned: *Ecce Caelum* (1867); *Pater Mundi* (1869); *Ad Fidem* (1871); *Ecce Terra* (1884); *Celestial Empires* (1885); *Universal Beliefs* (1887); *Long Ago as Interpreted by the Nineteenth Century* (1888); *Supreme Things in their Practical Relations* (1889); besides several historical stories, e.g., *Aleph* (n.e., 1902) and *Fabius* (1897).

BURR, GEORGE LINCOLN (1857-). An American historian. He was born at Oramel, N. Y.; graduated in 1881 at Cornell, and studied at Leipzig, the Sorbonne, the Ecole des Chartes, and Zürich, in 1884-86 and 1887-88. In 1888 he was appointed professor of ancient and mediæval history at Cornell. He was historical expert for the Venezuelan boundary commission in 1896-97. He is known chiefly as a student of the history of superstition. His works include *The Literature of Witchcraft* (1890), and *The Fate of Dietrich Flade* (1891). He became one of the editors of the *American Historical Review* and editor of the *Century Historical Series*.

BURR, THEODOSIA (1783-1813). The daughter of Aaron Burr, famous for her beauty, her accomplishments, and for her devotion to her father. She was born in New York City; was carefully educated by her father, showing considerable precocity, especially in linguistic studies; and after her mother's death, in 1794, until 1801 was mistress of her father's household. In 1801 she married Joseph Alston, a wealthy South Carolina planter, who subsequently was elected to the Governorship of the State. She did much to arouse a feeling of sympathy for her father at the time of his trial for treason as well as thereafter. In 1812 she started from Charleston in the pilot boat *Patriot* for New York, but the vessel was caught in a storm and was probably wrecked off Cape Hatteras, though its fate was never definitely ascertained. A tradition of uncertain origin makes the *Patriot* to have been taken by pirates and all those on board put to death.

BURR, WILLIAM HUBERT (1851-). An American civil engineer, born at Watertown, Conn. He received his education and professional training at the Rensselaer Polytechnic Institute and, after several years' engineering practice, was appointed professor of mechanics at the Institute. In 1884 he resigned the professorship to become assistant engineer to the Phoenix Bridge Company; subsequently he was appointed general manager to this company and

in 1891 was made vice president of a company of contracting engineers. In the following year he accepted the professorship of engineering at Harvard and early in 1893 a similar position at Columbia University in New York. After 1893 he was consulting engineer to New York departments, especially in connection with the Catskill Aqueduct work, and in 1904 was appointed a member of the Isthmian Canal Commission. His published works are: *Stresses in Bridge and Roof Trusses* (1879); *The Elasticity and Resistance of the Materials of Engineering* (1883; 3d ed., 1912); *The Graphic Method in Influence Lines for Bridge and Roof Computation* (1905, with M. S. Falk).

BURRAGE, HENRY SWEETSER (1837-1926). An American Baptist minister and author. He was born at Fitchburg, Mass., and was educated at Brown University, Newton Theological Institution, and at the University of Halle, Germany. He served in the Thirty-sixth Massachusetts Volunteers from 1862 to 1865 and was brevetted major at the close of the war. In 1873 he became editor of *Zion's Advocate*. Besides his edition of the works *Brown University in the Civil War* (1868) and *Rosier's Relation of Waymouth's Voyage* (1887), his publications include: *The Act of Baptism in the History of the Christian Church* (1879); *History of the Anabaptists in Switzerland* (1882); *Baptist Hymn-Writers and their Hymns* (1888); *History of the Baptists in New England* (1894); *History of the Baptists in Maine* (1904); *Gettysburg and Lincoln* (1906); *Maine at Louisburg in 1745* (1910).

BURBARD INLET. An arm of the Strait of Georgia in southwest British Columbia. It is 9 miles long; its shores, backed by the snow-capped Coast Mountains, and covered with forests of cedars, spruces, firs, and pines, abounding in game, are a favorite resort of sportsmen. The waters of the inlet abound in unique specimens of marine biology and also afford good fishing and bathing. Vancouver, the western terminus of the Canadian Pacific Railway, is situated on its south shore.

BURBELL, DAVID JAMES (1844-1926). An American clergyman and author. He was born at Mount Pleasant, Pa., and graduated at Yale in 1867 and the Union Theology Seminary in 1870. After being engaged in mission work at Chicago for four years, he successively was pastor of the Second Presbyterian Church, Dubuque, Iowa (1876-87); Westminster Church, Minneapolis (1887-91); and the Marble Collegiate Church, New York. A few of his more important works are: *The Religions of the World* (1891); *Hints and Helps* (1891-93); *The Gospel of Gladness* (1892); *The Early Church* (1897); *The Religion of the Future* (1894); *The Wonderful Teacher* (1902); *Teachings of Jesus Concerning the Scriptures* (1904); *The Lure of the City* (1908); *The Cloister Book* (1909); *In David's Town* (1910); *At the Gate Beautiful* (1911); *The Home Sanctuary* (1911); *The Gateway of Life* (1912); *The Old-Time Religion* (1913); *The Sermon* (1913).

BURRELL, MARTIN (1858-). A Canadian legislator. He was born in England and was educated at St. John's College, Hurstpierpoint, Sussex. He came to Ontario in 1886 and for 14 years engaged in fruit growing in the Niagara district. Removing to British Columbia in 1900, he entered municipal politics, continuing also the business of fruit growing. He was

elected mayor of Grand Forks in 1903. Before leaving Ontario he had become widely known as an authority on horticulture, and in 1907 the government of British Columbia appointed him its fruit commissioner and sent him to lecture in England. In 1908 he was elected as a Conservative to the House of Commons and again in 1911. In the same year he was appointed Minister of Agriculture in the administration of Robert Laird Borden (q.v.). In 1912 he was appointed a member of the Royal Conservation Commission.

BURRIAN, KARL (1870-1924). A German tenor, born at Prague. He appeared for the first time in 1892 in the rôles of Faust and Lohengrin, and in the following year in Berlin, in the rôle of Hans in Smetana's Opera, *Die verkaufte Braut*. Later he was for a time first tenor in the City Theatre of Cologne and then he sang in the court theatres at Berlin, Hannover (1896), and Hamburg (1898). In the latter year he also took the part of Parsifal in the Bayreuth Festival. In his tours he sang at Budapest, at Covent Garden, London, and at the Metropolitan Opera House, New York, where he also sang in 1913. Besides those mentioned his chief rôles include Tristan, Siegfried, Tannhäuser, Rudolf in *Bohème*, Faust, Werther, Diavolo, José, Radames, and Othello.

BURRIANA, BURRÉ-Á-NÁ. A town of Spain, in the Province of Castellón, about 8 miles south of the town of that name, situated in a fertile plateau on the right bank of the Río Seco, about 1 mile from its mouth in the Mediterranean (Map: Spain, E 3). Its inhabitants are chiefly engaged in agriculture and fishing, though a considerable trade in wine, oil, and fruit is carried on. Pop., 1900, 12,962; 1910, 14,243.

BURRILL, THOMAS JONATHAN (1839-1916). An American botanist, born at Pittsfield, Mass. He graduated from the Illinois State Normal University, was superintendent of the Urbana (Ill.) public schools in 1865-68, professor of botany and horticulture in the University of Illinois in 1870-1903, and thereafter professor of botany. In addition he served as dean of the College of Science (1878-84), dean of the general faculty (1894-1901), dean of the Graduate School (1894-1905), and acting president of the university (1891-94 and 1904). He is the author of some 200 articles in educational, botanical, and horticultural reports and periodicals and of the following publications: *The Forest Tree Plantation* (1893); *Varieties of Apples* (1896); *Orchard Cultivation* (1898); *Bitter Rot of Apples* (1907); *Ear Rots of Corn* (1909); *Parasitic Fungi of Illinois*, part ii (1913).

BURRILLVILLE. A town in Providence Co., R. I., 23 miles northwest of Providence, on the New York, New Haven, and Hartford Railroad (Map: Rhode Island, B 2). It is noted principally for manufactures of woollen goods. Wallum Lake, a summer resort, popular for its fishing and fine scenery, is a noteworthy attraction of the town. The government is administered by a town council, annually elected. Pop., 1890, 5492; 1900, 6317; 1910, 7878.

BURRITT, ELIHU (1811-79). An American philanthropist and linguist. He was born at New Britain, Conn., and first followed the occupation of blacksmith, which fact, together with his extraordinary aptitude for languages and his marvelously rapid mastery of them, gained for him the title of the "Learned Blacksmith." During a visit abroad in 1846-47 he was greatly touched by the suffering of the Irish peasantry

in the awful famine of that year. His diary of a tour through Ireland, at this time, for the purpose of relieving the destitution and misery, is one of the most graphic and touching descriptions of human suffering ever published. In 1848 he organized the first international congress of Friends of Peace, which convened in Brussels in September of that year, and which was followed in 1849 by a second "Peace Congress" in Paris, presided over by Victor Hugo. Burritt next lectured throughout the Union and then returned to Europe to attend the peace congresses in Frankfort-on-the-Main (1850), London (1851), Manchester (1852), and Edinburgh (1853). His conceptions of universal brotherhood and international arbitration received a rude shock upon the outbreak of the Crimean and Civil wars. He wrote: *Sparks from the Anvil* (1848); *Walks in the Black Country* (1869); *The Western and Eastern Questions of Europe* (1871). For his biography, consult Northend (New York, 1879).

BURRO, bur'ró. The Spanish name for the small donkey widely used as a pack animal in Mexico and the southwestern United States. A company of them is called a burro train. See Ass; and Colored Plate of HORSES.

BURROUGHS, BUR'RŌZ, GEORGE (c.1650-92). A Colonial clergyman in America, the most eminent victim of the Salem witchcraft delusion of 1692. He graduated at Harvard in 1670, subsequently preached for several years at Falmouth (now Portland, Me.), and from 1680 to 1683 was pastor of the church at Salem Village (now Danvers), Mass. In 1685 he returned to Falmouth, but afterward removed to Wells, where he was living at the time of the witchcraft delusion of 1692. Owing probably to the personal hostility of some of his former parishioners at Danvers, he was arrested early in 1692 on a charge of witchcraft, his indictment asserting that he, on May 9 "as well before, as after, Certain Detestable Arts called Witchcrafts and Sorceries, Wickedly and feloniously hath Used, Practised, & Exercised . . . in, Upon, & agt one Mary Walcott of Salem village by which said wicked Arts the said Mary . . . was and is Tortured, afflicted, Pined, Consumed, Wasted, and Tormented against the Peace of our Sovereign Lord & Lady, the King and Queen." Burroughs was also charged with having likewise bewitched three other girls, and at the trial "was accused by five or six of the Bewitched as the Author of their Miseries; . . . by eight of the Confessing Witches as being an head Actor at some of Their Rendezvouses, and one who had the promise of being a King in Satan's Kingdom, now going to be Erected; by Nine Persons for extraordinary Lifting and such feats of strength, as could not be done without Diabolical Assistance." He was finally convicted on each indictment, in spite of the report of a jury, ordered to search his body for witch marks, that "Wee find nothing upon ye body of ye Sayd burroughs but wt is natural"; and on August 19 he was executed on Gallows Hill, Salem, making a speech on the scaffold which moved the spectators to tears and called from Cotton Mather, alarmed lest the proceedings be discontinued, the assurance that "the Devil has often been transformed into an Angel of Light." Burroughs was the only minister who lost his life during the witchcraft delusion. Consult: Sprague, *Annals of the American Pulpit*, vol. i (New York, 1857-60); Sibley, *Graduates of Harvard University*, vol. ii

(Cambridge, 1873-85); Upham, *Lectures on Salem Witchcraft* (Boston, 1867); Perley, *Short History of the Salem Village Witchcraft Trials* (Salem, Mass., 1911).

BURROUGHS, JOHN (1837-1921). An American essayist and critic. He was born at Roxbury, N. Y., April 3, 1837, the son of a farmer. He spent his youth between study and work in the field and has said that his originality was fostered by growing up among people who neither read books nor cared for them. He was, however, a born author, and at 14 began to write essays, which have remained always his favorite form of expression. His first efforts were labored imitations of the ponderous lucubrations of Johnson; one of the first luxuries that he permitted himself having been the purchase of that author's works. A more congenial inspiration soon came to him from Emerson, whose *Essays* and *Miscellanies* he assimilated eagerly, and at 19 he succeeded in gaining admission to *The Atlantic Monthly* with an essay on *Expressions*. After Emerson, to whom Burroughs ascribes the awakening of his religious nature and a revolution in his literary expression, the great influences in his literary life were two: Walt Whitman, who was to him a great humanizing power, and Matthew Arnold, from whom he gained clarity, alike in thought and expression. All these influences came to him in their fullness before the publication of his first book, *Walt Whitman as Poet and Person* (1867). Meantime he had been engaged as teacher, as journalist, and as an official of the Treasury Department at Washington (1863-73). He was for some years afterward special national bank examiner, but during 1870-74 passed most of his time on a farm in Esopus, N. Y., where he divided his time between fruit culture and literature. Besides frequent contributions to periodicals, chiefly studies of nature and animal life, he wrote: *Wake Robin* (1871); *Winter Sunshine* (1875); *Birds and Poets* (1877); *Locusts and Wild Honey* (1879); *Pepacton* (1881); *Fresh Fields* (1884); *Signs and Seasons* (1886); *Sharp Eyes* (1888); *Indoor Studies* (1889); *Riverby* (1894); *A Study* (1897); *The Light of Day* (1900); *Squirrels and Other Fur-Bearers* (1900); *Literary Values* (1902); *Far and Near* (1904); *Ways of Nature* (1905), and *Bird and Bough* (1906); *Camping and Tramping with Roosevelt* (1907); *Leaf and Tendril* (1908); *Time and Change* (1912); *The Summit of the Years* (1913).

Burroughs's work, whether as a critic of literature, as in his works on Walt Whitman, Emerson, and Thoreau, or of religion, as in *The Light of Day*, most fully reveals the original personality of the man. In books, as in nature, it is the unconventional that appeals to him, and his own literary quality gains its fascination rather from the acuteness of his observation than from any elaboration in literary expression. He sees so clearly that he makes his reader see the individualized lives of birds, flowers, fishes, and even insects. His wide reading in English literature has been done with an eye to nature that gives to his similes and descriptive phrases a distinct literary flavor. In an article in *The Atlantic Monthly* of April, 1904, he expressed himself strongly in criticism of what he called the "sham natural history" of certain modern nature writers, or, as they then began to be called, "nature fakirs." The resultant controversy evinced a growing impatience on the part of

the public with any imaginative treatment of natural history that ignored the facts of that science. He was elected to the American Academy of Arts and Letters. Consult Barrus, *The Retreat of a Poet-Naturalist* (Boston, 1903); Henry James in his *Views and Reviews* (Boston, 1908); Julian Burroughs, *Boyhood Days with John Burroughs* (New York, 1912).

BURROUGHS, MARIE (1866-). The stage name of Lillie Arrington, an American actress, born in San Francisco. She made her first appearance in New York, at the Madison Square Theatre, in the part of Gladys in *The Rajah*. Other early successes were won in *Alpine Roses*, *Partners*, and *Saints and Sinners*. Afterward she appeared for several seasons with E. S. Willard (q.v.), in such plays as *The Middleman* and *Judah*, and as Ophelia (1894). In 1894 she began starring in *The Profligate* and other pieces. Later she played in *The Gadfly* with Stuart Robson and in *The Meddler*. In 1900 she appeared as Guida Landresse in *The Battle of the Strong*. Miss Burroughs was married to Robert Barclay MacPherson in 1901. Consult Strang, *Famous Actresses of the Day in America* (Boston, 1899).

BURROWING BEE. Any of several kinds of bees that form burrows in the ground as nesting places. Prominent among them are the genera *Andrena* and *Halictus*. See BEE; and accompanying Plate of WILD BEES.

BURROWING FOX. See FOX.

BURROWING OWL, or COQUIMBO. A small owl (*Speotyto cunicularia*), that dwells in the abandoned burrows of various fossorial quadrupeds, or, in the absence of these, digs a burrow for itself. It abounds on the open plains of both North and South America, those of southern Florida and of South America constituting well-marked geographical races; races also dwell in the islands of Bahama and Guadeloupe. They are of small size, about 9½ inches long, and have very long legs, scantily feathered; the tail is very short, there are no ear tufts, and the sexes are alike in size and color, which is brownish above and buffy below, variously barred and spotted with somewhat darker tints. The South American race (called "coquimbo") inhabits old burrows of the vizcachas, the Patagonian cavy, or even of armadillos and large lizards, or else excavates for itself. This race differs from the North American bird, which is diurnal, in being "crepuscular or nocturnal, . . . seldom feeding at all until towards sunset, when it becomes very active. On the pampas it is usually very tame, . . . but after sunset it becomes very vigilant, flying up and hovering at a height of 30 or 40 feet, and uttering its screams of protest whenever an intruder appears in sight, thus giving ample warning to its neighbors, the vizcachas" (*Stejneger*). The North American burrowing owls have been very thoroughly described by Dr. Elliott Coues in his *Birds of the Northwest*, from which the following is quoted:

"The burrowing owl is the only bird of its family inhabiting, in any numbers, the entirely treeless regions of the West, and may be considered characteristic of the plains. Wherever it can find shelter in the holes of such animals as wolves, foxes, and badgers, and especially of the various species of marmot squirrels, there it is found in abundance; and in not a few instances small colonies are observed living apart from their ordinary associates, in holes apparently dug by themselves. They constitute a

notable exception to the general rule of arboricole habits in this family, being specially fitted by their conformation for the subterranean mode of life for which they are designed, and are furthermore exceptional in their gregarious disposition, here carried to the extreme. The diffusion of the species in the West is so general that there is little occasion to mention particular localities.

"The notes of the burrowing owl are peculiar. The birds do not 'hoot,' nor is there anything lugubrious or foreboding in their cry. Sometimes they chuckle, chatter, and squeal in an odd way, as if they had caught a habit of barking from the 'dogs' they live with and were trying to imitate the sound. But their natural cry is curiously similar to that of the rain crow, or cuckoo of America—so much so that more than one observer has been deceived. They scream hoarsely when wounded and caught, though this is but seldom, since, if any life remains, they scramble quickly into a hole and are not easy to recover. The flight is perfectly noiseless, like that of other owls, owing to the peculiar downy texture of the plumage. By day they seldom fly far from the entrance of their burrow, and rarely, if ever, mount in the air. I never saw one on wing more than a few moments at a time, just long enough for it to pass from one hillock to another, as it does by skimming low over the surface of the ground in a rapid, easy, and rather graceful manner. They live chiefly upon insects, especially grasshoppers; they also feed upon lizards, as I once determined by dissection, and there is no doubt that young prairie dogs furnish them many a meal. Under ordinary circumstances they are not very shy or difficult to procure; I once secured several specimens in a few minutes, and, I fear, left some others to languish and die in their holes. As commonly observed, perched on one of the innumerable little eminences that mark a dog town, amid their curious surroundings, they present a spectacle not easily forgotten. Their figure is peculiar, with their long legs and short tail."

Their nests are made of soft materials in this underground chamber and contain seven or eight white eggs. They remain throughout the winter in and about their holes, though some may migrate from the most northerly and inclement part of their range. The story that they hibernate is fictitious. That they live harmoniously with the prairie dogs and prevalent rattlesnakes is also a fable. They are unwelcome neighbors to (not cotenants with) the squirrels, and the rattlesnakes enter the burrows as enemies to both. See OWL: Plate of OWLS.

BURROWING PERCH. See CULPER.

BURROWS, JULIUS CÆSAR (1837-). An American lawyer, born at Northeast, Erie Co., Pa. He practiced law until he entered the army in 1862 and again after the close of the war at Kalamazoo, Mich. From 1873 to 1895 he served several terms as a Republican in Congress and in 1895 was elected United States Senator. He was reelected in 1899 and again for the term of 1905-11. He is author of *History of the Marine Corps* (1909).

BURROWS, WILLIAM (1785-1813). An American naval officer. He was born near Philadelphia, entered the United States navy as a midshipman in 1799, and served as an acting lieutenant in the Tripolitan War. In the war with England he commanded the *Enterprise* in

the engagement with the *Boxer* off Portland, Me., on Sept. 5, 1813. The *Boxer* was taken: but Burrows was mortally wounded and lived only long enough to receive the surrender of Capt. Samuel Blythe, the English commander, who was also killed. The bodies of the two officers were buried side by side in Portland.

BURR/STONE. See BURSTONE.

BURSA (anat.). A pouch or sac containing a clear, viscid fluid, interposed between surfaces which move upon each other. Two varieties are recognized. Mucous bursæ are cavities, simple or irregular in form, found between the skin and bony prominences, such as the knee and elbow. Synovial bursæ are interposed between muscles and tendons as they pass over bony projections: the bursa between the glutei muscles where they pass over the great trochanter of the thigh bone is an example.

Bursitis is inflammation of a bursa, due generally to injury. A common form is that occurring in the prepatellar bursa and popularly known as housemaid's knee (q.v.).

BUR/SAR, BUR/SARY, or BURSE (*Burse* is a doublet of *purse*, Fr. *bourse*, pouch, from LL. *bursa*, purse, Gk. *βύρσα*, *byrsa*, hide, skin). The term "bursarii" was used in the mediæval universities to refer to those students who received aid from the university chest ("bursa") and also of students living in the university hostels maintained out of the "bursa." In the universities of Great Britain, especially in those of Scotland, and in early New England usage, the term "bursar" was not restricted to the keeper of a burse or purse—the treasurer—but it might mean, and often did mean, the recipient of a burse, or bursary, or, in other words, the holder of a scholarship. In Scotland the number of bursaries or foundations for the encouragement of students has been very large, and in recent years there has been a great deal of discussion of their influence—whether or not the conditions under which they have been awarded are as favorable as they might be to the promotion of learning. In a monastery the bursar would be the one who held and disbursed the income. In the sense of treasurer the office is still maintained in English universities and Harvard University and elsewhere, where the bursar is a sort of subtreasurer, charged with certain intramural duties, under the direction of the treasurer. In England the term is also used of candidates for the elementary school-teaching profession receiving maintenance from the state.

BURSCHENSCHAFT, *boor'shen-shäft* (Ger. *Bursche*, fellow, apprentice, student, from MHG. *burse*, purse; society, especially of students, with a common purse). An association of students in the German universities to promote patriotism, morality, and love of liberty. The earliest organization was at Jena in 1815, and its membership was chiefly made up of students who had fought in the War of Liberation. The idea spread to Tübingen, Heidelberg, Halle, and Giessen. In 1817, the occasion of the three hundredth anniversary of Luther's burning of the papal bull, a general gathering took place at the Wartburg, and the following year a constitution was adopted by delegates from 14 universities. Black, red, and gold, since taken as the national colors of the new German Empire, were adopted as the colors of the association. The murder of Kotzebue by Sand, a fanatical student, in 1819, injured the movement for free-

dom in Germany and led to repressive measures, such as the Carlsbad Decrees (q.v.), which required the suppression of the Burschenschaft, but secret meetings were still held, and there was a revival of the organization in 1827. The Burschenschaft participated in the Liberal demonstration known as the Hambach Festival in 1832. A revolutionary attempt took place at Frankfurt-on-the-Main in 1833, in which nearly 2000 students were implicated, and in nearly all of the German universities students were arrested, imprisoned, and disfranchised. The Burschenschaften, broken into factions, and declining in importance from this time, played only a minor rôle in the events of 1848, and at present exists as social fraternities.

BURSERACEÆ (Neo-Lat. *Bursera*, from Joachim Burser, a German botanist). A family of dicotyledonous plants with 13 genera and about 300 species, most of which occur in the tropics of both hemispheres, although a single species of *Bursera* (*B. gummifera*) is found in Florida. The species of this family are trees and shrubs with alternate, mostly compound, dotted leaves. The entire family is noted for the balsams and resins obtained from its representatives. The flowers are generally small, 4-5-parted; carpels 3-5, with usually 2 ovules in each. The fruit is a drupe or a capsule. For some of their products see **ELEMI**; **MYRRH**; **BALSAM**; **BELLITUM**; **OLIBANUM**; **FRANKINCENSE**.

BURSIAN, böör'sé-an, KONRAD (1830-83). A German archaeologist and classical scholar. He was born at Mützchen, in Saxony, was educated in Leipzig, and held professorships in the universities of Leipzig, Tübingen, Zürich, Jena, and Munich. His chief works are *Geographie von Griechenland* (1862-72); *Beiträge zur Geschichte der klassischen Studien im Mittelalter* (1873); *Geschichte der klassischen Philologie in Deutschland* (1883). He edited also Maternus, *De Erroribus Profanarum Religionum* (1856) and the *Suasoria* of Seneca Rhetor. He contributed also to Ersch and Gruber's *Allgemeine Encyclopädie* an elaborate article on Greek Art. He also founded (1873) and edited the *Jahresbericht über die Fortschritte der klassischen Alterthumswissenschaft*, a bibliographical work of immense value.

BURSTIS. See **BURSA**; **HOUSEMAID'S KNEE**.

BURSLAM (*Burward's* dwelling on the loam, AS. *lām*, Ger. *Lehm*, clay). A town of Staffordshire, England, on the Grand Trunk Canal, about 20 miles north-northwest of Stafford. It is in the pottery district (Map: England, D 3). Its two principal buildings are the Wedgwood Memorial Institute, opened in 1870, and containing an art school, a library, and a museum; and a fine town hall, erected in 1865. The town was incorporated in 1878. The abundance of coal and the variety of clays have made Burslem, since the seventeenth century, one of the chief seats of the fictile manufacture. Porcelain and pottery of all kinds—Parian, iron, and stoneware, etc.—are produced on a large scale, as well as encaustic tiles. There is also a glass manufactory here. The town's sewage is disposed of by irrigation and the refuse by a destructor. It owns its gas works, on which it makes a small annual profit; and its markets, which net about \$5000 annually. There are public baths. At Birche's Head, a mile and a half from Burslem, stands a large service reservoir of the Staffordshire Water-

Works Company, from which the town and neighborhood are supplied with excellent water. Pop., 1891, 32,000; 1901, 38,800; 1911, 44,145. Burslem was the native place of Josiah Wedgwood (q.v.).

BURT, WILLIAM (1852-). An American Methodist Episcopal clergyman, born in Cornwall, England. He graduated from Wesleyan University in 1879, and from Drew Theological Seminary in 1881. After five years in churches in Brooklyn, N. Y., he was made presiding elder of the district of Milan in the conference of Italy. He worked in Florence (1888-90), and from 1890 to 1904 in Rome, where he founded schools and a publishing house. He was elected a Bishop in 1904. The disfavor with which his work in Rome was viewed by the Papal Curia was brought to the attention of the public in 1910, when ex-President Roosevelt was asked (and refused) to pledge himself to have nothing to do with the Methodist mission if he wished to have an audience with the Pope. Bishop Burt wrote *Europe and Methodism* (1909).

BURT, WILLIAM AUSTIN (1792-1858). An American surveyor. He was born in Petersham, Mass., but in 1824 settled near Detroit, Mich. He became United States deputy surveyor in 1833, and in this capacity surveyed nearly the whole of northern Michigan (1840-47). As the inventor of the solar compass (1836), an instrument for readily determining a true meridian or north and south line and used in the survey of the United States public lands, in 1851 he received the prize medal for it at the London Industrial Exhibition. He was judge of the Michigan Circuit Court, and as a member of the Legislature in 1852 was prime mover in the construction of the Sault Ste. Marie Canal. He wrote *A Key to the Solar Compass and Surveyor's Companion* (6th ed., 1894).

BURTON (origin doubtful). A tackle used for special purposes. In rigged ships *top burtons* are hooked to burton pendants hanging from the topmast head. They are also used as additional supports to yards when the latter are rigged for hoisting heavy weights and for other similar purposes. A *sail burton* is a tackle for hoisting sails up to the yards for bending; the chief peculiarity is a runner, or guide block, which is lashed to the lower block of the purchase and travels on the hauling part, thus preventing the tackle from twisting and the sail from swaying about as it goes aloft. See **TACKLE**.

BURTON, ERNEST DEWITT (1856-1925). An American biblical scholar. He was born in Granville, Ohio, graduated at Denison University in 1876 and at Rochester Theological Seminary in 1882, and studied in Germany at Leipzig and Berlin. He taught at Rochester and at Newton seminaries (1882-92), and then became head of the department of New Testament literature and interpretation at the University of Chicago. He identified himself with the university's work for Sunday schools and in 1897 became editor of the *American Journal of Theology*. With Shailer Matthews he wrote *Constructive Studies in the Life of Christ* (1901) and *Principles and Ideals of the Sunday School* (1903), and with J. M. P. and G. B. Smith, *Biblical Ideas of Atonement* (1909). He also published: *Short Introduction to the Gospels* (1904); *Studies in Mark* (1904); and *Some Principles of Literary Criticism and their Application to the Synoptic Problem* (1904).

BURTON, JOHN HILL (1809-81). A Scottish jurist, historian, and encyclopædist, born in Aberdeen, Aug. 22, 1809. He graduated at Marischal College, Aberdeen, studied law, and was admitted to the Edinburgh bar, but supported himself by literature. From 1833 he contributed articles on law, history, and political economy to the *Westminster Review*, literary sketches to *Blackwood's Magazine*, and also wrote for the *Scotsman* and the *Cyclopædia of Universal Biography*, *Waterson's Cyclopædia of Commerce*, and *Chambers's Encyclopædia*. In 1854 he was relieved from monetary precariousness by a governmental appointment. His most important original work is *The History of Scotland, from Agricola's Invasion to the Revolution of 1688* (7 vols., 1867-70). A new edition, enlarged and partly rewritten, appeared in 8 vols., 1873. In 1879 he published a *History of the Reign of Queen Anne*. The merits of Burton's historical works are universally admitted. He held the ancient office of Historiographer Royal for Scotland, was LL.D. of Edinburgh University, and D.C.L. of Oxford. He died near Edinburgh, Aug. 10, 1881. Some of his chief contributions to *Blackwood's* were published as *The Book Hunter* (Edinburgh, 1862; 1882). Consult "Memoir of Burton" in *Blackwood's Magazine* (September, 1881), and a *Memoir* by his wife, prefixed to *The Book Hunter* (New York, 1863).

BURTON, MARION LEROY (1874-1925). An American college president. He was born in Brooklyn, Iowa, graduated from Carleton College (Minnesota) in 1900, and received a Ph.D. from Yale in 1907. He immediately took the post of assistant professor at Yale for one year and filled the pulpit of the Church of the Pilgrims, Brooklyn, the year following. After a year's travel in Europe, he was inaugurated president of Smith College, Northampton, Mass., in 1910, the second president in the history of that institution. He published *The Problem of Evil* (1909); *The Secret of Achievement* (1913); *Our Intellectual Attitude in an Age of Criticism* (1913).

BURTON, RICHARD (EUGENE) (1859-). An American minor poet, born in Hartford, Conn., and educated at Trinity College (1883) and Johns Hopkins (1887). He was managing editor of *The Churchman* (1889-90), literary editor of the *Hartford Courant* (1890-97), and professor of English literature in the University of Minnesota (1893-1902). Among the published volumes of his poetry are: *Dumb in June* (1895); *Lyrics of Brotherhood* (1899); *Message and Melody* (1903). He published also: *Literary Likings* (1898); *John Greenleaf Whittier* (1901); *Forces in Fiction* (1902); *Literary Leaders in America* (1904); *Masters of the English Novel* (1909); *Time and Change* (1912); *New American Drama* (1913).

BURTON, SIR RICHARD FRANCIS (1821-90). A British traveler and author, born in Hertfordshire, England, March 19, 1821. In 1842 he entered the Indian army and served many years in Sindh. In 1851 he published his first important work—*Sind, and the Races that Inhabit the Valley of the Indus*, full of graphic description and interesting to all readers. Burton acquired a very familiar acquaintance with Hindustani, Persian, and Multani, and learned to speak Arabic like a native. Thus equipped, he resolved to explore Arabia in the disguise of an Afghan pilgrim. Political commotions

prevented him from traversing the whole country, as he intended; but his *Personal Narrative of a Pilgrimage to El Medinah and Meccah* (1855) records an extraordinarily daring feat. His next journey was into the country of the Somalis, in eastern Africa. His companion, Lieutenant Stroyan, was killed, and he himself was wounded. He succeeded, however, in reaching Harrar, a town not before visited by any European, and in penetrating a vast and populous region scarcely known to geographers. Towards the end of 1856 he set out, in company with Lieutenant Speke, also of the Indian army, to ascertain the truth of the reports collected by the missionaries that a vast lake existed in the heart of Africa. The journey led to the discovery in 1858 of the great lake of Tanganyika (followed by the discovery of the Victoria Nyanza by Speke) and the opening up of the eastern part of the continent. In 1861 Burton was appointed Consul at Fernando Po, off the west coast of Africa, and while holding this appointment he visited the Kamerun Mountains, and went on a mission to the King of Dahomey, the incidents of both journeys being recorded in two of his most interesting works. He was subsequently Consul at Santos in Brazil and at Damascus, and on the death of Charles Lever, in 1872, he succeeded to the post of British Consul at Trieste. He died Oct. 20, 1890. Among his many works are the following: *Sind; or, the Unhappy Valley* (1851); *Goa and the Blue Mountains* (1851); *Falconry in the Valley of the Indus* (1852); *First Footsteps in East Africa* (1856); *The Lake Regions of Equatorial Africa* (1860); *The City of the Saints* (1861); *Abeokuta; or, the Cameroon Mountains* (1863); *The Nile Basin* (1864); *A Mission to Gelele, King of Dahomey* (1864); *Explorations in the Highlands of Brazil* (1869); *Vikram and the Vampire* (1870); *Zanzibar* (1872); *Gorilla Land* (1875); *Ultima Thule; or, a Summer in Iceland* (1875); *Etruscan Bologna* (1876); *Sind Revisited* (1877); *The Gold Mines of Midian and the Ruined Midianite Cities* (1878). In 1885-88 he published a literal translation of the *Arabian Nights* under the title of *The Thousand Nights and a Night* (10 vols., and 6 vols. of supplement), remarkable for its minutely frank notes. The translation of the text is far less important, and has not unjustly been regarded as in part borrowed from the great version by John Payne (q.v.). Burton's wife issued an expurgated edition in 6 vols. (1887). In 1894 appeared the Library edition, 12 vols., an abridgment of the original publication. He left a manuscript to his widow, Lady Isabel (Arundell) Burton, consisting of a translation, with original notes, from the Arabic of *The Scented Garden*, which she destroyed as a moral act, though it was deemed of great importance by scholars and had been valued at \$30,000. A literal translation of the *Pentamerone* by Burton was published posthumously (1893). To Burton we are also indebted for the best English translation of the *Lusiad* and the lyrics of Camoëns (1881-84). For his life, consult: Hitehman (London, 1887); Lady Burton (New York, 1893); Stisted (New York, 1897); also a mawkish book by Lady Burton and W. H. Wilkins, *The Romance of Isabel, Lady Burton* (New York, 1897); and T. Wright, *The Life of Sir Richard Burton* (2 vols., 1906).

BURTON, ROBERT (1577-1640). The author of *The Anatomy of Melancholy*. He was born at

Lindley, in Leicestershire, Feb. 8, 1577, and was educated at Brasenose and Christ Church, Oxford. In 1616 he was appointed to the vicarage of St. Thomas, in the west suburbs of Oxford; and about 1630 to the rectory of Segrave in his native county. Though he officiated at St. Thomas for a time, he passed his life almost wholly at Christ Church, where he died Jan. 25, 1640, at or near the time he had foretold by the calculation of his horoscope. To the Bodleian Library he left his rare collection of books. His brother erected a monument to his memory in the cathedral of Christ Church. Anthony Wood, in the *Athena*, thus wrote of him: "He was an exact mathematician, a curious calculator of nativities, a general read scholar, a thorough-paced philologist, and one that understood the surveying of lands well. As he was by many accounted a severe student, a devourer of authors, a melancholy and humorous person, so by others who knew him well, a person of great honesty, plain dealing, and charity. I have heard some of the antients of Christ Church often say that his company was very merry, facetious, and juvenile." The *Anatomy* was first published in 1621. Burton was constantly revising his work, of which four more editions appeared during his life. After his death the final version was printed from his annotated copy (1651-52). Burton dedicated himself to melancholy, analyzing its various manifestations after the formal manner of treatises on divinity. His book is one of the most curious and interesting in the whole realm of literature. Dr. Johnson said that it "was the only book that ever took him out of bed two hours sooner than he wished to rise." Milton read it, deriving hints for *Il Penseroso*; Sterne pillaged it; Lamb admired it and imitated its quaint style. Consult *The Anatomy*, edited by Shilleto, with introduction by Bullen (3 vols., London and New York, 1896). A definitive edition by Aldis Wright was announced in 1910. Consult *Cambridge History of English Literature*, vol. iv, pp. 242-267 (Cambridge and New York, 1906-1913).

BURTON, THEODORE ELIJAH (1851-). An American legislator, born in Jefferson, Ohio, and educated at Ohio College and at Oberlin. He took up the practice of law, but soon became active in politics. In 1889-91 and again from 1895 until 1909 he was a member of Congress. He had been reelected for the term 1909-11, but resigned to accept a seat in the Senate. For ten years he was a most efficient chairman of the House Committee on Rivers and Harbors. In 1904 and 1908 he was a delegate to the Republican National Convention, in the latter year presenting the name of William H. Taft for nomination for the presidency. He was made a member of many important committees in the Senate, and in 1913 was chairman of the Committee on Canadian Relations. His writings include: *Financial Crises and Periods of Commercial and Industrial Depression* (1902); *Corporations and the State* (1911), and a biography of John Sherman in the *American Statesmen Series*. He became a member of the National Monetary Commission and was chosen president of the American Peace Society.

BURTON, WILLIAM EVANS (1804-60). An English actor and playwright, born in London, a son of William George Burton, author of *Biblical Researches*. He was intended for the Church and received a classical education, but at 18 took charge of his father's printing estab-

lishment and edited a magazine. From amateur acting he drifted towards the regular stage and made a successful début at the Haymarket in 1832. He began also to write dramas, one of which, *Ellen Wareham*, was played simultaneously at five London theatres. In 1834 he came to the United States, where he was prominent as actor or manager, chiefly in Baltimore, Philadelphia, and New York. In Philadelphia he established the *Gentleman's Magazine*, a literary monthly, of which Poe was at one time the editor. His greatest success was in the management of the Chambers Street Theatre, in New York City, where, with Brougham and others, he produced dramas from several of Dickens's novels. His own forte was low comedy, and some of his characters were very popular. Such were *Captain Cuttle*, *Toodles*, *Micauber*, *Aminadab Sleek*, *Paul Pry*, and others. He was a fine scholar and had a superior library, particularly of Shakespearean literature. He was for several years the editor of the *Literary Souvenir* and published in two volumes a *Cyclopædia of Wit and Humor*. Consult Keese, *William E. Burton* (New York, 1885).

BURTON-UPON-TRENT. A town in Staffordshire, England, about 11 miles southwest of Derby, on the river Trent and the Trent and Mersey Canal (Map: England, E 4). A bridge of 34 arches, built before the Norman Conquest, crossed the river here, but was replaced in 1864 by a new one of 29 arches. Burton-upon-Trent at one time was quite celebrated for its cotton mills, but this industry has been entirely superseded by that of ale brewing. There are over 30 breweries in Burton, some of them on a scale of unparalleled magnitude. The Bass establishment covers more than 500 acres, employs about 3000 men, brews annually about 1,400,000 barrels of ale and stout, and pays annually about \$2,300,000 in beer duty. The Allsop brewery is next in size. The town was incorporated in 1878. Its water works are in the hands of a private company. Its sewage is disposed of by irrigation. The town has owned its gas works since 1854 and makes an annual profit of about \$45,000 (1909-10). It has also operated an electric light plant since 1894 (in 1909-10 at a profit of about \$30,000) and a street railway. It maintains public baths, markets, a cemetery, and a library. Pop., which has increased rapidly since 1870, 1891, 46,000; 1901, 50,400; 1911, 48,275. The town dates from the end of the ninth century, when it grew up around an abbey founded at that time. It suffered severely during the civil wars in the seventeenth century.

BURTSCHELD, böört'shît (Lat. *Poroetum*, Fr. *Bourcette*). A southern suburb of Aix-la-Chapelle (q.v.), up to 1897 an independent municipality in the Rhine Province, Germany. It is noted for its numerous thermal springs and manufactures of iron, steel, needles, and woolen goods, the last being the most important.

BURTSELL, RICHARD LALOR (1840-1912). An American Roman Catholic priest. He was born in New York, April 14, 1840. He pursued his studies at the Propaganda in Rome, taking his degree there and receiving his ordination in 1862. Returning to New York, he was appointed assistant pastor of St. Anne's Church and in 1868 assigned to the new parish of the Epiphany. He was the first incumbent in the office of "Defender of the Marriage Tie" (q.v.), instituted in America by the Third Plenary Council of the

Catholic Church, held in Baltimore in 1884. In 1887 he identified himself with a movement in which the Rev. Dr. McGlynn (q.v.) was concerned. This involved him in personal trouble. He was removed from the office of "Defender of the Marriage Tie" in 1887; official notice of his action was taken in 1889; and he was ordered to retire from his position as pastor of the Church of the Epiphany to a small parish in Rondout, N. Y. He appealed from the order of the Archbishop to the Propaganda at Rome, and by that body was ordered to make his submission to the Archbishop. He appealed to Rome for reinstatement, and was refused in 1896. In 1904 he was made domestic prelate by Pope Pius X, and in 1905 was appointed rector of St. Mary's Church, at Kingston, N. Y.

BURU, bōō'rōō, **BOEROE**, or **BOORO**. An island of the Molucca group of the Dutch East Indies, situated about 50 miles west of Amboina and Ceram, from which it is separated by Buru Strait. It lies between lat. 3° and 4° S., and long. 126° and 127° 20' E. (Map: East India Islands, G 5). Its length is about 90 miles, and its area about 3356 square miles, including Ambalau Island (71 square miles). It is very mountainous, especially in the western part, Mount Tumahu rising to 8530 feet, and is thickly wooded. Sago, tropical fruits, and dye and teak woods are the chief products. The population is about 15,000; the chief town is Cajeli, on the eastern coast. Administratively it is a dependency of Amboina.

BURUJIED, bōō'rōō-jēr'd'. A town in the Province of Irak-Ajemi, Persia, situated in a fertile valley on the river Tahi, about 190 miles northwest of Ispahan. It has a castle and several mosques and manufactures cotton goods and felt hats and caps. It has a trade in skins with Russia and is connected by roads with Ispahan and Hamadan. Pop., about 25,000.

BURUNDUK, bōō'rūn-dōōk' (Russ., a species of squirrel). A striped ground squirrel (*Tamias asiaticus*) of northern Asia and Europe, closely resembling in appearance and habits the American chipmunk.

BURWASH, NATHANIEL (1839-). A Canadian educator and theologian. He was born near St. Andrews, Quebec, and was educated at the public schools and at Victoria University, Cobourg, where he graduated in 1859. He pursued his theological studies at Yale University and at the Garrett Biblical Institute, Evanston, Ill. He was ordained to the Methodist ministry in 1864, and after a few years as pastor was appointed professor of natural science in Victoria University. During 1874-87 he was dean of the theological faculty and professor of biblical and systematic theology in that institution, and in 1887-1913 was its chancellor. He took a prominent part in the federation of Victoria and Toronto universities. He was Methodist secretary of education in 1874-86, president of the General Conference in 1889, and a delegate to the Ecumenical Methodist Conference in Washington (1891) and London, England (1901). Among his writings are *Wesley's Doctrinal Standards* (1881); *Handbook on the Epistle to the Romans* (1887); *Inductive Studies in Theology* (1896); *A Manual of Christian Theology* (1900); "The Life and Times of Egerton Ryerson," in the *Makers of Canada* series (1902); *The Development of the University of Toronto as a Provincial Institution* (1905).

BUBY, bër' (AS. *burh*, fort, borough). A

flourishing manufacturing town in the southeast of Lancashire, England, on rising ground, backed by hills on the north and east, and on the Irwell, 10½ miles northwest of Manchester (Map: England, D 3). Bury obtained a charter of incorporation in 1876. The town's affairs are administered by a mayor, a municipal council of 30, and a board of aldermen of 10 members. (See GREAT BRITAIN, *Local Government*.) The town has an excellent water supply, and modern sewage works, and it has owned and operated gas works since 1858 and an electric light plant since 1896. Among other municipal undertakings are public baths, opened in 1864, markets, and an infectious-diseases hospital. Bury was early a seat of the woolen manufactures, carried on by Flemings; but these, though still considerable, now yield in importance to those of cotton. Besides spinning and weaving factories, there are important print, bleach, paper, and dye works, and some large foundries and engine manufactories. In the vicinity are excellent freestone quarries, and many coal mines. Pop., 1891, 57,262; 1901, 58,028; 1911, 58,649.

BURY, bū'ri, JOHN BAGNELL (1861-1927). An Irish scholar. He was educated at Trinity College, Dublin, of which he became fellow and tutor in 1885. In 1893 he was appointed professor of modern history in Dublin University. In 1898 he was transferred to the chair of Greek. In 1902 he became regius professor of modern history in the University of Cambridge. He edited the *Nemean Odes of Pindar* (1890), the *Isthmian Odes* (1892), and *Freeman's History of Federal Government in Greece and Italy* (1893). His edition of *Gibbon's Decline and Fall* (1896-99), with elaborate introduction and notes, is the best edition of Gibbon's work. His other publications include a *History of the Later Roman Empire from Arcadius to Irene* (1889); a *Student's History of the Roman Empire from Augustus to Marcus Aurelius* (1893); *History of the Roman Empire 27 B.C.-180 A.D.* (1893); *A History of Greece to the Death of Alexander the Great* (1900), which has been revised for American students by Everett Kimball (1907); *The Imperial Administrative System in the Ninth Century, with a Revised Text of the Kletorologion of Philotheos* (Oxford, 1911). He planned also *The Cambridge Medieval History*, to consist of 8 vols., 2 of which have appeared.

BURY, RICHARD DE (1281-1345). An English prelate, so called from his birthplace, Bury Saint Edmunds; his real name was Aungerville. He was educated at Oxford and became a Benedictine monk at Durham; was tutor to Edward III; was appointed dean of Wells in 1333, and in the same year was sent on a mission to the Pope, who made him Bishop of Durham. He held the office of Lord Treasurer (1334), Lord Chancellor (1335), and then became one of the King's ambassadors in foreign countries. He was noted for his beneficence, and founded a large library in connection with Durham College, Oxford (afterward suppressed). His chief work, *Philobiblon* (Eng. version, London, 1834), describes his manner of collecting books and gives an account of the state of learning in England and France. He was a friend of Petrarch at Avignon. Consult Boardman, *Richard de Bury* (Bangor, Me., 1902); Dutt, *Bury St. Edmunds* (London, 1907); Kitchin, *Seven Sages of Durham* (London, 1911).

BURY (bër') **FAIR**. The title of a play

by Thomas Shadwell (1690), following the lines of Molière's *Précieuses ridicules*.

BURYING BEETLES. The largest of the carrion beetles, Silphidae, belonging to the genus *Necrophorus* (Gk. νεκρός, dead + φέρω, carry). The name "burying" or "sexton beetles" has been given them on account of their habit of burying the dead bodies of small vertebrates as a nidus for their eggs and food for the young. Thisthey accomplish by digging away the earth beneath the body until the latter sinks below the surface of the ground. The female deposits her eggs in it, and when the larvæ hatch they feed on the carcass. The largest North American species is *Necrophorus americanus*, 1½ inches long. It is a black beetle with two red spots or bands on the elytra. Ten distinct species are recognized in the United States. See Colored Plate of BEETLES.

BURY SAINT EDMUNDS, or SAINT EDMUNDSBURY (borough in memory of St. Edmund, the martyr). A market town and ancient borough in Suffolk County, England, on the Lark, 26 miles northwest of Ipswich (Map: England, G 4). It is well built and delightfully situated. The chief commercial interest of the town is in the corn and cattle markets held there. The town abounds in historical remains, the more important of which are: the ruins of the famous Benedictine abbey, consisting of a western gate, a handsome specimen of decorated Gothic, and the tower or church gate, a fine example of massive Norman; and the Gothic churches of St. James and St. Mary, the latter containing the tomb of Mary Tudor, daughter of Henry VII of England and wife of Louis XII of France. The town sends one member to Parliament. It owns its water works and maintains public baths, markets, a hospital, and a school of art. Pop., 1891, 16,630; 1901, 16,255; 1911, 16,785.

Bury Saint Edmunds, originally Beodricsweorthe (perhaps upon the site of the Villa Faustina, of the Romans), received its name from Edmund, the Saxon King and martyr, who was killed here in 870 by the Danes and whose tomb became a noted shrine of pilgrimage. Here Swayn raised a Benedictine abbey, which after Glastonbury became the richest and most important in England. Between the abbots and the townspeople frequent battles occurred. From 1020 to its dissolution by Henry VIII it was ruled over by a line of 33 abbots. Consult Hill, "Antiquities of Bury Saint Edmunds," in *Archæological Journal*, vol. xxi (London, 1865).

BUSACO, bōō-sā'kō. A ridge on the north side of the river Mondego, in the Province of Beira, Portugal, about 20 miles north-northeast of Coimbra. Here Wellington, with about 40,000 British and Portuguese troops, repulsed the attack of Masséna with 65,000 French, Sept. 27, 1810. Unable to force the position, Masséna turned it by passing over an adjoining ridge, and Wellington retired behind the lines of Torres Vedras.

BUSBECQ, bus'bék', **BUSBEC**, or **BUSBK**, **AUGIER GHISLAIN DE** (Latinized Busbequius) (1522-92). A Flemish diplomat and scholar, born at Comines. He received the best university training of his day at Louvain, Paris, and various Italian universities, and entered the service of Ferdinand, King of the Romans, whose Ambassador he accompanied to England in 1554. From London he was sent to the Turkish court, where for eight years he rendered important

diplomatic services. In 1562, however, he was recalled to become tutor and guardian to the sons of Maximilian II, and from 1574 he held the post of master of ceremonies to the Archduchess Elizabeth, widow of Charles IX of France. He was also employed by the Emperor Rudolph II as Ambassador at Paris. On quitting this post in 1592, Busbecq set out for Flanders, but died on the way at the castle of Maillot, near Rouen, Oct. 28, 1592. Busbecq's most important work is his volume of letters from Turkey—*Legationis Turcicæ Epistolæ Quatuor* (Paris, 1589)—a scholarly study of the Ottoman power. His *Epistolæ ad Rodolphum II Imperatorem, e Gallia Scriptæ* (Brussels) contains much interesting information on contemporary French history. His other works have been lost. A collected edition of his extant works appeared at Leyden (1633), and another at Basel (1740). He has been frequently translated into French, German, and English. His Latin style is pure, elegant, and simple. Busbecq was a great collector of manuscripts, and gave over 100 to the library at Vienna. He was also a botanist and introduced the horse-chestnut tree into Europe. Consult: Forster and Daniell, *The Life and Letters of Ogier Ghiselin de Busbecq* (London, 1881), which contains his most important writings; also, De Thou, *Histoire de mon temps* (Paris, 1604); Saint-Genois, *Les voyages belges* (Brussels, 1847); Dupuis, "Etude sur l'ambassade d'Augier de Busbecques en Turquie," in *Mémoires de la Société des Sciences de Lille*.

BUSBY, bŭz'bī (probably from a proper name). The full dress or "review" uniform headgear of different branches of the British army. In the Hussar Cavalry and Royal Horse Artillery the busby is of fur, with a cloth top, from which is suspended on the right side a cloth bag, known as the busby bag, which is of the same color as the facings of the regiment, as is also the tuft or plume worn on the top front of the busby. The massive busby worn by the Foot Guards is made of expensive bearskin over a skeleton framework, and in the case of commissioned officers surmounted by a lofty white plume. The Highland regiments wear a busby after much the same pattern as the Foot Guards, but of somewhat smaller proportions and far less intrinsic value. The Rifle Brigade wear a busby of modified shape, made of astrakhan with a small stiff plume in front. In the case of the Guards, Highlanders, and Rifle Brigade, the busby is without bag or busby cords. The busby, like the brilliant uniform of which it forms a part, is worn only in times of peace. On active service it is superseded by the helmet and "puggaree."

BUSBY, RICHARD (1606-95). A noted English schoolmaster. He was born in Lutton, Lincolnshire; was educated at Westminster School and at Oxford, and in 1638 was provisionally appointed head master of Westminster School, the duties of which office he continued to discharge until his death. As a pedagogue he was conspicuous alike for learning, assiduity, and the application of the birch. He was a most successful teacher, and at one time could point to no fewer than 16 occupants of the bench of bishops who had been educated in his school. Altogether he has the reputation of having "bred up the greatest number of learned scholars that ever adorned any age or nation." Dryden, Locke, and Robert South were among his pupils.

Dr. Busby published several works, but they were chiefly expurgated editions of the classics for school use. Among the number are: *A Short Institution of Grammar* (1647); *An English Introduction to the Latin Tongue* (1659); *Rudimentum Latinum, Grammatica Literalis et Numeralis* (1688).

BUSCH, bush, MORITZ (1821-99). A German publicist. He was born in Dresden, studied theology and philosophy in Leipzig, and began literary life as a translator of Dickens, Thackeray, and other English authors. In 1851 he visited the United States, and on his return published *Wanderungen zwischen Hudson und Mississippi* (1853) and *Die Mormonen* (1857). He then engaged in newspaper work and attracted Bismarck's attention by his articles in the *Grenzboten*. On April 1, 1870, he received an appointment in the German Foreign Office, but his real function was that of a reporter for the press to Prince Bismarck. From that time and for many years he was the inseparable companion and confidant of the Chancellor, taking daily notes of his sayings and doings, and earning for himself the title of "Bismarck's Boswell." In 1878 he published a part of his diary, kept during the Franco-Prussian War, under the title of *Graf Bismarck und seine Leute während des Kriegs mit Frankreich*; this was published also in English in 1879. In 1884 he published the life of his hero, which was soon issued in an English translation under the title *Our Chancellor*. Two months after the death of Bismarck Dr. Busch published a large work, which was immediately translated into English under the title *Bismarck: Some Secret Pages of his History* (1898).

BUSCH, WILHELM (1826-81). A German surgeon, born in Marburg. He studied at the University of Berlin; was in 1855 appointed professor of surgery at Bonn, and afterward acted as consulting surgeon-general in the army in 1866 and during the Franco-Prussian War. His published works include the following: *Ueber das Gehirn der Selachier* (1848); *Chirurgische Beobachtungen, gesammelt in der Klinik zu Berlin* (1854); *Lehrbuch der Chirurgie* (2 vols., 1857-69).

BUSCH, WILHELM (1832-1908). A German caricaturist, painter, and poet. He was born at Wiedensahl, Hanover, and studied at the Technical High School in Hanover. In 1851 he took up painting at the academies of Düsseldorf and afterward at Munich, but dissatisfied with the tendencies at Munich under W. von Kaulbach, the director, he painted independently, using a technique based upon that of the great Flemish and Dutch masters. Although they were never exhibited, his paintings show great ability. He is best known as a caricaturist. His activity in this direction was developed in Munich as a member of the artistic society "Young Munich." From 1858 till 1871 he was one of the most popular illustrators for the *Fliegende Blätter*. His early manner displayed satirical skill and much facility in characterization by slight outline strokes, but his later work is less finished. He published a series of sketches, for which he himself composed suitable text in verse; these became exceedingly popular in Germany and in other countries. The best known are: *Max und Moritz* (1865), of which 436,000 copies were sold; *Hans Huckelbein, der Unglücksrabe* (1874); *Der heilige Antonius von Padua* (1870); *Die fromme Helene* (1872); *Schnurdi-*

burr ("The Bees," 1872); *Pater Filucius* (1874); *Herr und Frau Knipp* (1876); *Der Schmetterling* (1895). Among his poems without illustrations are *Zu Guter Letzt* (1904) and *Schein und Sein* (1909). Consult his autobiography in *Pater Filucius*; and the biography by Schankal (Munich, 1905).

BUSCHE, by'she, HERMANN VON DEM (1468-1534). A German scholar, born at Sassenberg in Westphalia. He studied at Deventer in Holland, at Heidelberg, at Tübingen, and (for five years) in Italy, where he became versed in Latin, and after his return to Germany traveled about from one university centre to another, lecturing on the classic literature and antiquities. He is said to have written some of the *Epistolæ Obscurorum Virorum*. At all events, he joined the leaders of the Reformation, was a friend of Ulrich von Hutten, and in 1527 was appointed first professor of classical literature at the University of Marburg, founded in that year by Landgrave Philip the Magnanimous. He was the first to edit the *Carmen De Bello Civili*, preserved in Petronius (q.v.) (1500); he edited also Silius Italicus (1504), and the *Amphitruo* of Plautus. He wrote three books of epigrams, a defense of humanistic studies entitled *Vallum Humanitatis* (1518), and other works. Consult Liessem, *Hermann von dem Busche, sein Leben und seine Schriften* (Cologne, 1884-89), which contains a bibliography.

BÜSCHING, by'shing, ANTON FRIEDRICH (1724-93). A German geographer. He was born in Stadthagen in Schaumburg-Lippe and studied theology at Halle, where he enjoyed the friendship of Baumgarten. In 1754 he was appointed professor of philosophy in Göttingen, but in 1761 accepted an invitation to St. Petersburg as preacher to a Protestant congregation there. In 1766 he was called to Berlin as superior consistorial counselor and director of a gymnasium, and died there. Until the appearance of Büsching's *Neue Erdbeschreibung* (7 parts, 1754-92), neither Germany nor any other nation possessed a geographical work which made any pretension to scientific treatment or completeness of execution. Political changes have deprived the work of its original value, but it has been corrected and edited by subsequent writers. Of his other numerous publications, the most important is the *Magazin für Historiographie und Geographie* (25 vols., 1767-93).

BÜSCHING, JOHANN GUSTAV GOTTLIEB (1783-1829). A German antiquary, son of the preceding, born in Berlin. He studied law at Erlangen and Halle, was appointed royal archivist at Breslau in 1811, and in 1817 professor of archaeology in the university there. His knowledge of literature, art, and antiquities of the German Middle Ages was remarkable. His works include: a *Sammlung deutscher Lieder*, with musical accompaniments (1807); *Deutsche Gedichte des Mittelalters* (3 parts, 1808-25); *Grundriss zur Geschichte der deutschen Poesie*, in collaboration with Von der Hagen (1812); *Des Deutschen Leben, Kunst, und Wissen im Mittelalter* (4 vols., 1816-18); *Ritterzeit und Ritterwesen* (2 vols., 1823).

BUSCHMANN, bush'man, JOHANN KARL EDUARD (1805-80). A German philologist, born at Magdeburg. He studied at the universities of Berlin and Göttingen, and collaborated with the brothers Von Humboldt in the preparation of their works, particularly with Alexander in the

Kosmos (1845-58). His researches in comparative philology were very important. They were directed chiefly towards the dialects of Malaysia and Polynesia and those of Central and north-western America. Many of the results of this work are to be found in the *Kauisprache auf der Insel Java* (3 vols., 1836-39) of W. von Humboldt, which after Humboldt's death Buschmann completed and edited for the press. His own publications include: *Aperçu de la langue des Iles Marquises et de la langue taitienne* (Berlin, 1843); *Ueber die aztekischen Ortsnamen* (1852); *Die Spuren der aztekischen Sprache im nördlichen Mexiko* (1858); *Grammatik der vier sonorischen Hauptsprachen* (3 parts, 1863-69).

BUSEMBAUM, bōō'zem-boum, or **BUSENBAUM**, bōō'zen-boum, HERMANN (1600-68). A German Jesuit, known as a casuist. He was born at Notteln in Westphalia, and entered the Jesuit order in 1619, taught scholastic and moral theology in Cologne, and was rector successively of Jesuit colleges in Hildesheim and Münster. In 1645 he published his *Medulla Theologiæ Moralis, Facili ac Perspicua Methodo Resolvens Casus Conscientiæ*, in 7 books. This work passed through 45 editions between 1645 and 1670, and has since been frequently reprinted. It met no considerable opposition until it appeared in 1729 in Lyons and in 1716-33 in Cologne, edited by Lacroix, with a commentary and supplementary material from other casuists. The long controversy over its teachings on regicide was altogether unwarranted by the text, for when sifted down, it simply meant the right of self-defense. It was publicly condemned by the Parliament of Paris and burned by that of Toulouse. Although less bold in its declarations than some other Jesuit books, such as, e.g., the *Defensio Fidei* (1613) of Francisco Suarez, it was the most complete and systematized in its exposition, and served as a type for succeeding treatises of the sort.

BUSENTO, bōō-sēn'tō (anciently, Lat. *Bucentius*). A small stream in south Italy, which flows into the Crati at Cosenza (q.v.), and in the bed of which Alarie (q.v.) is said to have been buried, the stream having been temporarily turned aside from its channel in order to provide a secret grave.

BUSEO. See BUZAU.

BUSH, GEORGE (1796-1859). An American biblical scholar, born in Norwich, Vt. He graduated at Dartmouth College in 1818 and studied at the Princeton Theological Seminary from 1820 to 1822. He was pastor of a church in Indianapolis from 1824 to 1829 and was professor of Hebrew and Oriental literature at the College of the City of New York from 1831 to 1848. Among his works of that period were a *Life of Mohammed* (1832); a series of biblical commentaries under the title of *Notes on Genesis, Exodus, etc.* (1840-52); and *Anastasis; or the Doctrine of the Resurrection* (1844), in which he denied the existence of a material body in a future life. He embraced the doctrines of Swedenborg in 1847, and became editor of the *New Church Repository*. His later works include: *Mesmer and Swedenborg* (1847); *New Church Miscellanies* (1855); *Notes on Numbers* (1858). For his biography, consult Fernald (Boston, 1860).

BUSH, KATHARINE JEANETTE (1855-). An American zoölogist. She was born in Scranton, Pa., and was educated in the public and private schools of New Haven, Conn. She

studied zoölogy under Prof. A. E. Verrill (q.v.) and in 1879 assumed the position of assistant in the zoölogical museum at Yale. She served on the United States fish commission, helped to edit the 1890 edition of *Webster's Dictionary*, and was made a member of the American Society of Naturalists and the American Society of Zoölogists. She wrote "The Tubicolous Annelids of the Tribes Sabellides and Serpulides," in *Harriman Alaska Expedition*, vol. xii (1905), besides *Deep Water Mollusca* (1885) and *New Species of Turbonilla* (1899).

BUSH-BROWN, HENRY KIRKE (1857-). An American sculptor born at Ogdensburg, N. Y. He was a pupil of the National Academy of Design and of his uncle Henry Kirke Brown in New York, whose adopted son he was, and in 1886-90 he studied in Paris and Italy. Among his works are "A Buffalo Hunt," the equestrian statues of Generals Meade and Reynolds, also the Lincoln Memorial at Gettysburg; the statue of Justinian on the Appellate Courthouse, New York City; and the sculptural decoration of the Hall of Records, New York City. He became a member of the National Sculptural Society, and took a prominent part in the movement for municipal art. He excels especially in his sculpture of animals, which he represents with realism and considerable creative ability.

BUSH BUCK (Dutch *boschbok*, bush goat). A sportsman's name for several African antelopes frequenting bushy regions, especially two groups: 1. The genus *Tragelaphus*, otherwise known as "harnessed" antelopes because of the often conspicuous vertical whitish stripes that characterize all except the most familiar bush buck of South Africa, *Tragelaphus sylvaticus*. (See Colored Plate of ANTELOPES.) Another, the guib (*Tragelaphus scriptus*), is not larger than a goat. These two are probably merely geographical varieties or subspecies, as they grade into each other. They feed only in early morning and late evening in the more open spaces and live in pairs. The voice is a loud, hoarse bark. They feed on leaves, fruits, and all sorts of tubers and sometimes do considerable damage to gardens. When wounded, the bucks are dangerous and have been known to kill dogs and even men, impaling them on their sharp horns. But the bongo of the equatorial west coast is 3 feet 7 inches tall; the nakong (*Tragelaphus spekei*) is large and plain in color and has a mane. (Compare KOOBOO.) A very complete account of these antelopes is given by R. Crawshaw in the *Proceedings of the Zoological Society of London* (1890), and by Lydekker in *Game Animals of Africa* (London, 1908). Leopards are their natural enemy, but in some regions they enjoy immunity from harm by men during the breeding season, as at Port Elizabeth, where they are preserved for sport and pursued in organized drives at certain seasons of the year. 2. The genus *Cephalophus*. See DUKEE.

BUSH DOG. 1. A small South American wild dog (*Ictiocyon venaticus*) of the British Guiana highlands, "with close hair and short legs and tail, distinguished from all other dogs by its small size and by the reduction of the molar teeth to one in the upper jaw." It resembles a fox in appearance and hunts in packs. It is about 2 feet in length, blackish in general, becoming golden brown on the head and back. Consult *Proceedings of the Zoological Society of London* (1879, p. 664; 1880, p. 70) and *Field* (London, Feb. 21, 1880). 2. The potto.

BUSHEL (OF. *bussel*, LL. *bussellus*, from *bussula*, dim. of Lat. *burus*, box; literally, something made of boxwood). A dry measure used in America and Great Britain for grain, fruit, etc., but varying in each nation. It is first defined at the time of Henry III in the Statute of the Assize of Bread and Ale (51 Hen. III, Stat. I, 1266) in the paragraph providing that "and eight pounds do make a gallon of wine, and eight gallons of wine do make a bushel which is the eighth part of a quarter." Henry VII caused standards representing the above definitions to be constructed in 1495, and the Winchester corn gallon and the standard corn-bushel measures are still in existence, having capacities of 274¼ and 2150½ cubic inches, respectively. The latter gives the United States standard bushel of 2150.42 cubic inches. On the reorganization of weights and measures in 1824 the Imperial standard bushel was made equal to eight Imperial gallons of 277.420 cubic inches each, or the volume of 10 pounds of distilled water at 62° F., or a volume of 2219.36 cubic inches, thus being 3.2 per cent greater than the United States legal bushel.

BUSH GOAT. A bush buck (q.v.).

BUSH HOG. The boschvark or river hog. See SWINE.

BUSHIDO, bū-shē'dō (literally *bu*, military + *shi*, knight + *do*, way). The precepts of knighthood, under which that unique figure in Japanese and Asian history, the Samurai (q.v.), was reared. As in Europe chivalry grew out of feudalism, Christianity interpreting it with convenient concessions yet infusing it with spiritual data, so of Japanese chivalry there were several sources—Buddhism, Shinto (q.v.), and Confucianism. (See CHU HI.) The characteristics of bushido were rectitude or justice, courage, benevolence, politeness, truthfulness, honor, and, above all, loyalty. It further inculcated in the Japanese knight, gentleman, and lady self-control, the acme of which was realized in the institutions of suicide (see HARA-KIRI) and revenge, the girded sword being the soul of the Samurai. It gave lofty ideals and training, and a position to woman remarkable in Asia. Despite the abolition of feudalism, its mother and nurse, and the introduction of modern ideas and codes of law, bushido is still powerful as a regulator of Japanese life and institutions. Consult: Griffis, *The Religions of Japan* (London, 1895); Knapp, *Feudal and Modern Japan* (Boston, 1897); Inazo Nitobe, *Bushido, the Soul of Japan* (Philadelphia, 1900); Bondegger, "*Buschido*" *die Geheimwissenschaft Japans* (Berlin, 1909); Harrison, *The Fighting Spirit of Japan* (New York, 1913); Okakura-Yoshisaburo, *The Life and Thought of Japan* (London, 1913).

BUSHING (Dutch *bus*, Ger. *Büchse*, box, from Lat. *burus*). A perforated piece of metal screwed or pressed into place in certain machinery or objects for the purpose of receiving the wear of moving parts, to decrease the size of holes, or to secure a better joint, or one which will not stick; in the latter case the bushing is made of metal not very easily oxidizable, such as brass or bronze.

BUSHIRE, bū-shēr'. See ABUSHEHR.

BUSH/MAN'S RIVER. A stream in the southeastern part of the Cape of Good Hope Province, South Africa, about 100 miles long (Map: Cape of Good Hope, L 9). It flows southeast and empties into the Indian Ocean about 75 miles east of Port Elizabeth.

BUSH MASTER (master of the bush). The largest-known venomous snake (*Lachesis mutus*), a pit viper of the rattlesnake family, closely related to the fer-de-lance and inhabiting the Amazonian region. "In length it equals the hamadryad, and in thickness the large African viper." Specimens 9 feet in length were measured by Catherine Hopley, who thinks the snake may sometimes exceed this length, and indeed since her record a snake 12 feet long has been measured. Waterton's often-quoted description of size and "rainbow colors" is, however, certainly greatly exaggerated. In color it is pale yellow, darker on the back and lighter below, with a chain of rich chocolate-brown jagged rhomboid spots, edged with a darker color, along the back. The tail tapers suddenly, and terminates in several "rows of spiral scales, which are slightly recurved or hooked at their summit," forming the rudiments of a rattle and ending in a horny tip or spine. Its teeth and



TAIL OF BUSH MASTER.

poison apparatus resemble those of a rattlesnake, and the fangs are immense, making it a most deadly serpent and one very greatly dreaded. Death has been known to occur within 10 minutes after the bite of an 8-foot snake. It is said to prey largely upon other snakes, and its venom has been utilized in medicine. It is terrestrial in habits, not climbing trees, but living in dens and holes in the ground and frequenting river banks. Darwin made the following interesting remarks upon it in his *A Naturalist's Voyage* (London, 1860).

"Cuvier . . . makes this a subgenus of the rattlesnake, and intermediate between it and the viper. In confirmation of this opinion, I observed a fact, which appears to me very curious and instructive, as showing how every character, even though it may be in some degree independent of structure, has a tendency to vary by slow degrees. The extremity of the tail of this snake is terminated by a point, which is very slightly enlarged; and as the animal glides along, it constantly vibrates the last inch; and this part striking against the dry grass and brushwood produces a rattling noise, which can be distinctly heard at the distance of 6 feet. As often as the animal was irritated or surprised its tail was shaken, and its vibrations were extremely rapid. . . . This Trigonoccephalus has, therefore, in some respects the structure of a viper with the habits of a rattlesnake; the noise, however, being produced by a simpler device."

This habit of vibrating the tail when excited is, however, common to many serpents, as, e.g., the North American copperhead (q.v.). The French name for this snake is *le muet*; and "bush master" is sometimes applied in Guiana to any large and dreaded serpent. The native names most widely accepted are *surucucú* and *mapepire*. The bush master is altogether untamable and has never been known to feed voluntarily in captivity. And if food be forcibly given, the shock kills the snake. So its longest lease of life in a cage is four or five months. Consult: Hopley, *Snakes* (London, 1882); Bates,

A Naturalist on the River Amazon (New York, 1884); Moles and Ulrich, "Serpents of Trinidad," in *Proceedings Zoological Society of London* (London, 1894); Ditmars, *Reptiles of the World* (New York, 1910). See Colored Plate of FOREIGN VENOMOUS SERPENTS, with the article SNAKE.

BUSHMEN (*bush* + *man*, from Dutch *boschjesman*, as living in the bush). Peoples of the deserts of southern Africa, comprising wandering bands of hunters, among the culturally simplest of human beings. They are short of stature (1.529 meters) and yellow brown in color. Some ethnologists regard them as related to the pygmies, but there is no satisfactory proof of this. Their language is harsh, abounding in clicks, some of which are shared by the Hottentots. This fact may have given rise to the erroneous notion that the Hottentots and Bushmen are closely related, while in fact they are racially, culturally, and linguistically distinct. Bushmen subsist on wild roots, berries, and plants, insects, snakes, and game, usually half cooked, though they are acquainted with boiling and make fire with the two-stick fire drill. Game is taken by means of traps, and fish are caught in nets, by poisoning the waters, or with harpoons; the dog is the only domestic animal. The Bushmen live in clefts of the rock and caves in the mountains; in the plains a hole dug in the ground and roofed with reeds forms the house. They keep a fire burning during the night. Their social organization is not well understood; yet they appear to be the remnant of an old stock, for their legends are numerous and zoötheistic in character. They have a rude artistic sense, evidenced by rock paintings and petroglyphs. Consult Bleek, *Reynard the Fox in South Africa* (London, 1864); Stow, *Native Races of South Africa* (New York, 1905); Bleek and Lloyd, *Specimens of Bushman Folklore* (London, 1911). See Colored Plate of AFRICA, DARK RACES.

BUSHNELL. A city in McDonough Co., Ill., 60 miles west of Peoria, on the Chicago, Burlington, and Quincy and the Toledo, Peoria, and Western railroads (Map: Illinois, B 3). The city owns its water works and has manufacturing of wood and steel tanks, pumps, wagons, and buggies, brick, and garden tools. It is also a distributing point for farm machinery, and ships considerable poultry. Pop., 1890, 2314; 1900, 2490; 1910, 2619.

BUSHNELL, HORACE (1802-76). An American theologian. He was born in Litchfield, Conn., April 14, 1802; graduated at Yale in 1827, where he studied law and theology; in 1833 became pastor of the North Congregational Church in Hartford, resigned 1859, and died there Feb. 17, 1876. He was a voluminous writer on theological subjects, some of his works being *Principles of National Greatness*; *Christian Nurture* (1847); *God in Christ* (1849); *Christian Theology* (1851); *Sermons for the New Life* (1858); *Nature and the Supernatural* (1858); *Work and Play* (1864); *Christ and His Salvation* (1864); *Woman's Suffrage, the Reform against Nature* (1869); *The Vicarious Sacrifice* (1865). He was also a writer for various periodicals and newspapers. He was a bold and original thinker, with peculiar eloquence of style. Though strongly evangelical in belief, he denied the Calvinistic theory of the atonement (known as the "satisfaction theory") and gave less than the ordinary emphasis to the

distinction between the persons in the Trinity. These, with other divergences, led to his being accused of heresy; but ultimately the fellowship of the Congregational churches was found broad enough to include him, and he kept his standing therein with growing influence until his death. During his later years his health compelled his relinquishment of the active pastorate, but his labors in authorship were unintermitted. While his theory of the atonement, the so-called "moral-power" view, has not commended itself in his exact form to the majority of evangelical Christians and is adhered to by no organized sect or party, it cannot be denied that his moral earnestness, his spiritual power, his wondrous suggestiveness, his brilliancy of thought and style, and his broad mental scope profoundly modified the thinking of the age, through almost the whole circle of Protestant denominations. Indeed, with his detestation of all provincialism and sectarianism, he would have chosen any other form of influence rather than that which is exercised by the leader of a party in the Church. His select works appeared in a collected edition (8 vols., 1876-77). Consult: M. B. Cheney, *Life and Letters of Horace Bushnell* (New York, 1880); T. T. Munger (Boston, 1899).

BUSH QUAIL (Anglo-Indian). See BURTON QUAIL.

BUSHRANGERS. An Australian term originally applied to runaway convicts, who had taken to the "bush" and become robbers. Early in the nineteenth century they established a reign of terror in sparsely settled Van Diemen's Land. In 1814 a band of bushrangers, 27 in number, carried on their operations till, in 1815, martial law was proclaimed. Under Governor Arthur (1824-36) 103 of these criminals were executed in two years. In 1830 a severe Bush-ranging Act was passed in New South Wales, where a gang of 50 desperadoes fought regular engagements with the settlers and police and surrendered only when a detachment of soldiers was brought up from Sydney. Among notorious acts of bush-ranging must be mentioned the celebrated Eugowra (New South Wales) gold-escort robbery of 1862, undertaken by a Capt. Frank Gardiner and his gang, in which enterprise the booty amounted to 5509 ounces of gold and £7490 in bank notes. Among notorious New South Wales bushrangers were Donohoe (shot dead in 1829), the two Clarkes (executed in 1867), John Dunn (executed in 1865), Frank Gardiner (pardoned in 1874 on condition of departing for America), John Gilbert (shot dead in 1865), Ben Hall (shot in 1865), Daniel Morgan (shot dead in 1865), John Peisley (executed in 1862), Frederick Ward, alias Captain "Thunderbolt" (shot dead in 1870), and William John Westwood, alias "Jacky Jacky" (executed in Tasmania in 1846). In Victoria, among other notorious scoundrels were Captain Melville (who died by his own hand in Melbourne jail in 1859), Henry Power (arrested while asleep and sentenced to a long term of imprisonment), and the Kelly gang, consisting of four highwaymen, whose list of outrages, both in Victoria and New South Wales, ended at Glenrowan in the former state in June, 1880, when three of the band were shot and burnt (in the burning of the hotel which they were defending) by the police troops sent to affect their arrest, and the leader, Ned Kelly, was captured, dressed in a suit of armor roughly

made from plowshares, taken to Melbourne, tried and executed. Tasmania's bushrangers include Michael Howe (shot in 1818), Cavenagh, Martin Cash, Brady, "Mosquito," and "Jacky Jacky" already mentioned, who headed several hundred escaped prisoners in an attack on the Governor's quarters in Norfolk Island. The Jewboy Gang, the Rosses, Macgregor—the "Wild Scotchman" of the Queensland bush, and numerous other infamous rascals have contributed their quota to the atrocities of the past which are now handed down in Australian history. Telephones, telegraphs, and railway lines long since made bushranging impossible. Consult Boxall, *History of the Australian Bushrangers* (London, 1908).

BUSH TIT. One of the diminutive titmice of the genus *Psaltirparus*. They are plain ashy-gray or olive-gray pygmies, paler or whitish below, without bright colors or conspicuous markings, and are scarcely 4 inches long. They are found in the western and southwestern United States and in Mexico. The nests are large, woven of various vegetable tissues, pensile, and with a lateral entrance. The eggs are six to nine in number, white, without markings.

BUSH/WHACKER (*bush* + *whack*, to beat or hang about; hence to carry on guerrilla warfare). A term much in use during the Civil War in the United States (though well known before) to indicate men who pretended peace or neutrality, but who were ready to make secret attacks whenever opportunity offered.

BUSHY RUN, BATTLE OF. See BOUQUET, HENRY.

BUSIRIS (Gk. Βούσιρς, House of Osiris). A city of ancient Egypt devoted to the cult of the god Osiris. It was situated about the centre of Lower Egypt and is usually identified with the modern Abusir, just south of the parallel of 31°. Busiris is probably a variation, like Osiris, of Usiri, the name of the god to whom the city of Busiris was sacred. According to a legend preserved in Greek literature Busiris was an ancient king of Egypt, during whose reign a famine of nine years afflicted the country. Upon the appearance at the court of Busiris of Phrasius, a Cypriote soothsayer, who said that the famine would end if a foreigner were sacrificed to Zeus every year, the King fulfilled the conditions by inaugurating the practice of sacrifice by offering up Phrasius himself. Busiris eventually met his own death at the hands of Herakles, whom he attempted to sacrifice to Zeus. Apparently this tradition in some way attaches to the story of Osiris and Set, for, as it will be remembered, the former met his death through the machinations of the latter.

BUSK, GEORGE (1807-86). An English scientist, born in St. Petersburg, Russia. He studied surgery, in 1832 became assistant surgeon to the seamen's hospital ship *Grampus*, subsequently was transferred to the *Dreadnaught*, and retired in 1855 with the rank of full surgeon. He then devoted himself to zoölogy and paleontology. He published his *Catalogue of Polyzoa in the British Museum* (1852-54), and his monograph on *Polyzoa of the Crag* (1859). He wrote on cave and valley remains of the rhinoceros, the hyena, the *Elephas* (African elephant), and the extinct bears. He was also interested in ethnology, and in 1873-74 was president of the Anthropological Institute. He improved craniometrical apparatus. In 1850 he had been chosen a fellow of the Royal Society,

and in 1859 fellow of the Geological Society of London. He was an authority on the lowest division of the molluscan series; and a genus of Bryozoa was named *Buskia* in his honor.

BUSK, HANS (1815-82). One of the foremost originators of the volunteer movement in England. He was educated at King's College, London, and Trinity College, Cambridge, and in 1841 was called to the bar. While an undergraduate he sought to interest the government in the establishment of rifle clubs as a means of national defense and published a treatise on *The Rifle and How to Use It*. Though discouraged by Lord Melbourne, he formed a rifle club at the university, in 1853 rehabilitated the Victoria Rifles, then the only existing volunteer corps, and furthered the enterprise by monographs and lectures. He was the first to suggest the advisability of life-ship stations and equipped at his own expense a model ship. He also assisted in the founding of a school of cookery at South Kensington. His most important publication is *The Navies of the World: Their Present State and Future Capabilities* (1859).

BUSKIN (of uncertain origin). A kind of half-boot, lacing tight to the leg. The ancient tragic actors, at least in late Greek and in Roman times, wore buskins (*cothurni*), often with thick soles, to add to their stature; consult K. K. Smith, "The Use of the High-Soled Shoe or Buskin in Greek Tragedy of the Fifth and Fourth Centuries B.C." in *Harvard Studies in Classical Philology*, vol. xvi (1905). Hence the buskin is often put for tragedy, as the slipper or sock (*soccus*, a flat-soled shoe) stands for comedy. The name is sometimes used by modern writers to describe the hunting boots worn by Diana and often by other hunters or horsemen in ancient art.

BUSONI, bōō-zō'nē, FERREUCIO BENVENUTO (1866-1924). A famous pianist and composer. He was born at Empoli, near Florence, April 1, 1866, of an Italian father and a German mother. Both parents were excellent musicians, and from them he received his first musical education. The only other teacher he ever had was Dr. W. Mayer in Graz. In 1886 he settled in Leipzig, and two years later went to Helsingfors as teacher at the Conservatory. The winning, in 1890, of both Rubinstein prizes for composition and piano playing gained for him an appointment as professor at the Conservatory of Moscow, where, however, he remained only a year. In 1891-93 he taught at the New England Conservatory in Boston. Since 1894 he has resided at Berlin, with the exception of the winter of 1907-08, when he taught at the Vienna Conservatory. His extensive concert tours throughout Europe have been one uninterrupted series of triumphs, and he met with the same success on his visit to the United States in 1910-11. His preëminence among the great pianists is due to a rare combination of excellent qualities which are usually found distributed among separate individuals: a stupendous, unerring technic, vigorous mentality, grandeur of conception, emotional intensity, exquisite refinement, artistic moderation, keen analytical power, unlimited resources of tonal color and nuances. His memory is phenomenal and his repertory enormous. In 1911, during the celebration of the Liszt centenary in Germany, he played in six recitals not only all the original piano compositions but also all the transcriptions of Liszt. Busoni has made masterly transcriptions for the piano

of many of Bach's organ works, and completed with rare skill the last unfinished fugue from that master's *Art of Fugue*. (See BACH.) He also published an authoritative edition, with critical notes and special studies, of Bach's *Well-tempered Clavichord*. His original compositions consist of a *Konzertstück* for piano and orchestra (which won the Rubinstein prize); a concerto for piano and orchestra with a choral finale; a concerto for violin and orchestra; a symphonic poem, *Pojohla's Tochter*; two suites for orchestra; a *Lustspiel-Ouverture*; music to Schiller's *Turandot*; two string quartets; a suite for 'cello; a serenade for 'cello; two violin sonatas; variations and fugue on Chopin's Prelude in C minor; and many compositions for piano. An opera, *Die Brautwahl*, was produced in 1912 in Hamburg with considerable success. That Busoni is also a serious and original thinker about his art he has shown by his book *Entwurf einer neuen Aesthetik der Tonkunst* (1907), which also appeared in an English translation by Th. Baker (1911). After a phenomenally successful tour of Italy in 1913 he accepted the directorship of the Conservatory at Bologna, a post carrying with it the conductorship of the symphony concerts and the supervision of music generally. At the same time the French Academy made him *Chevalier* of the Legion of Honor, a distinction heretofore conferred upon only two Italians, Rossini and Verdi.

BUSRA. See BASRA.

BUSSA, bū's-sā. See BUSSANG.

BUS/SANG. A town of Central Africa, in the British Protectorate of Northern Nigeria. It is situated on an island of the Niger and is surrounded by a wall. Its population is estimated at about 12,000. Mungo Park met his death here in the whirlpools along the right bank.

BUSSANGO. See BORGU.

BUSSEY, bū'sī, BENJAMIN (1757-1842). An American merchant and philanthropist, born in Canton, Mass. He served as a private soldier throughout the Revolutionary War; then began business in Boston, and accumulated a large fortune, which he bequeathed to Harvard University—one-half for the support of the law and divinity schools and one-half for the foundation of the Bussey Institute, a school of agriculture and horticulture, for which special object he gave a large farm near Boston. His total bequest was estimated at \$350,000.

BUSSEY, CYRUS (1833-1915). An American soldier, born at Hubbard, Ohio. He early became interested in politics, entered the Iowa Senate as a Democrat, and in 1860 was a delegate to the Baltimore convention which nominated Stephen A. Douglas for President. He served throughout the Civil War, in 1865 commanding the third division of the Seventh Army Corps, with the rank of major general; during the siege of Vicksburg he had been chief of cavalry in General Grant's army. He carried on, for some time after the war, a commission business in St. Louis and New Orleans. was Assistant Secretary of the Interior in 1889-93, and after that was engaged in law practice. He was commander of the District of Columbia Commandery, Military Order of the Loyal Legion of the United States, in 1911-12.

BUSSLER, bū'slēr, LUDWIG (1838-1901). A German musical theorist and critic, born in Berlin. He was a pupil of Grell, Dehn, and Wieprecht, was for some time a musical director

at Memel in East Prussia, and later became an instructor in various conservatories in Berlin. In 1883 he was appointed musical critic of the *Berlin National-Zeitung*. He published a number of valuable textbooks, including *Musikalische Elementarlehre* (1867; 7th ed., 1897); *Kontrapunkt und Fuge im freien Tonsatz* (1878); *Musikalische Formenlehre* (1878; 2d ed., 1894); *Kompositionslehre* (2 parts, 1878-79); a *Geschichte der Musik* (1882); and a *Lexikon der musikalischen Harmonien* (1889).

BUSSONE, bū's-sū'nā, FRANCESCO. See CARMAGNOLA.

BUSSORA, bū's-sō-rā. See BASRA.

BUSSU (bū's-sū) **PALM** (native Brazilian name) (*Manicaria saccifera*). A South American palm, growing in the tidal swamps of the Amazon. The stem is 10 to 15 feet high, curved or crooked and deeply ringed. The leaves are simple or undivided and are the largest of the kind produced by any known palm, being often 30 feet long and 4 or 5 feet wide. The flower clusters are branched, drooping, and the fruit is of an olive color, large, hard, and three-seeded. The leaves make excellent and durable thatch, being split down the midrib and laid obliquely on the rafters, so that the furrows formed by the veins lie in a nearly vertical direction and serve as so many little gutters to carry off the water. The spathe (the sheath of the flower cluster), taken off entire, is used by the Indians as a bag, or the larger ones are stretched out to make caps. When split, the spathes make a kind of strong, coarse cloth.

BUSSY D'AMBOIS, bū'sē' dān'bwā'. The title of a play by George Chapman. The date of its first production is placed, on internal evidence, in 1604. A sequel, under the title *The Revenge of Bussy d'Ambois*, appeared in 1613, and an adaptation by D'Urfé in 1691.

BUSSY-RABUTIN, bū'sē' rā'bwū'tān', ROGER, COMTE DE (1618-93). A French soldier and courtier, the author of the *Histoire amoureuse des Gaules* (1665), partly adapted in manner and even in incident from the famous Roman novel or *Satira* by Petronius (q.v.). This work is a thinly veiled version of the notorious court scandals of his own time and in part at least of his own creation. It created a deep sensation and influenced the development of the realistic novel towards the fictitious memoir. (See REALISM AND NATURALISM.) Bussy-Rabutin was a relative of Madame de Séigné (q.v.), came of an illustrious family, and was educated by the Jesuits. The *Histoire* was written for private circulation among friends, but was surreptitiously copied and published by the Marchioness de Baume in Holland with an entirely superfluous key. Bussy-Rabutin was arrested (1665), imprisoned for 13 months in the Bastille, and then exiled to Burgundy, where he spent the remainder of his life in peace. Meanwhile the work grew by unauthorized and more outrageous additions in prose and verse. Bussy's original portion is an airy, graceful, but very realistic picture of a corrupt society, which perhaps no other author could have given. Bussy's *Mémoires*, of minor interest, appeared in 1696 (ed. by Lalanne, 2 vols., 1857), and his *Lettres*, 1697-1709 (ed. by Lalanne, 6 vols., Paris, 1858-59); while the best edition of the *Histoire amoureuse* is that of Boiteau (3 vols., Paris, 1859). Consult Gailly, *Un académicien, grand seigneur, et libertin au XVII^e siècle: Bussy-Rabutin, sa vie, ses œuvres et ses succès* (Paris, 1909).

BUST (Fr. *buste*, It. *busto*, from ML. *bus-tum*, the trunk of the body). In plastic art, the name given to a representation in the round of the head, neck, and breast of the human body. It was a form of sculpture apparently unknown to Egyptian, Assyrian, and other Oriental arts, though the Egyptians of the early empire made fine portrait heads. As early as the sixth century B.C. the Greeks made *Hermæ*, heads of *Hermes* or *Dionysus*, mounted on pillars, and this form, common for the ideal heads of the sixth and fifth centuries, was used as the favorite form of bust until the Roman period. At this time they were often made double—two heads back to back. It was not until Alexander's time that busts were commonly used for purposes of portraiture in Greece, for until then sculpture had concerned itself less with realistic reproduction than with types. After that time the bust became perhaps the favorite form of portraiture. The two most important known series are portraits of Alexander—with the head drawn down on one side and the eyes raised—and of his successors the Ptolemies of Egypt and the Seleucids of Syria, as well as the minor kings of the Hellenic East, such as the Attalids. Another large class of Hellenistic busts are those of men of letters—poets, philosophers, orators—such as Plato, Zeno the Stoic, Epicurus, and other philosophers, Isocrates, and Demosthenes. To these authentic portraits should be added ideal heads of earlier personages, such as Homer, Pericles, Anaxagoras, and other early philosophers, of whom there were certainly no contemporary likenesses. At this time bronze was even more popular than marble as a material for busts. Various sizes were in vogue; some were more than life-size, for use in public places, others were diminutive, for chamber decoration. Founders of museums and libraries and wealthy amateurs sought to procure sets of such busts.

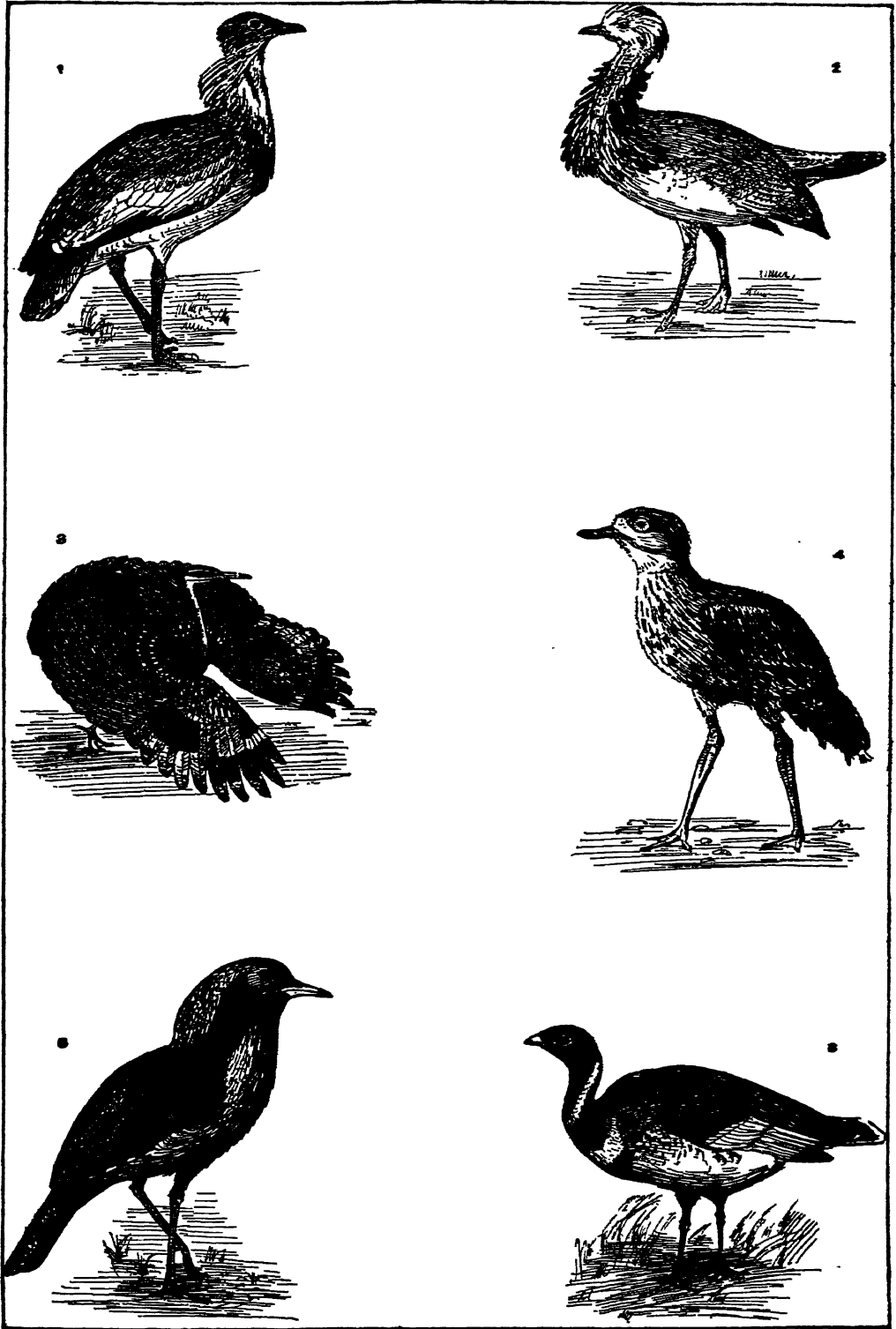
The portraitists of this period showed great ability in expressing the dominant traits of character without descending to realism. In this respect they differed from those other great portraitists of the ancient world, the Etruscans and Romans. The custom of these two peoples of preserving and carrying in procession the *imagines*, wax portraits of ancestors who had distinguished themselves, contributed to the popularity of portrait busts. The superb bronze Etruscan bust of the elder Brutus in the Capitoline probably antedates any of the Greek portraits, and its form of draped shoulders in place of the herm shape was afterward almost universally adopted. The forums and other public places were encumbered under the Republic with marble and bronze portrait figures. Still, the busts preserved to us seem all to belong to the Imperial period, or the generation preceding it; those that represent Republican worthies being apparently not contemporary. Even the heads of the elder Scipio Africanus are of doubtful authenticity. The custom of collections of *lares* and *penates* popularized the use of busts, as did the founding of libraries, museums, and private collections. Villas, houses, and public buildings were filled with busts. There is an uninterrupted chronological series from Augustus to Julian the Apostate. The most numerous series is that of the emperors and members of the Imperial family. The largest collection of these is at present in the Capitoline Museum; the next in the Vatican Museum in Rome. The British Museum and Louvre have some good

examples. It is by means of a comparison with coins and medals that most of these can be identified with certainty, for the inscriptions on busts are not always reliable. The series of portrait busts of philosophers and poets was far less popular than before the Empire. Private collections of busts were not unknown, as, e.g., those of M. Terentius Varro and Pomponius Atticus. The letters of Cicero and Pliny show how they were made. One such collection has fortunately been unearthed in the Villa dei Papi at Herculaneum, belonging to a philosopher of the time of Cicero. This group, now in the Naples Museum and mainly of bronzes, is the finest of its kind preserved from antiquity. The collector's taste was catholic. His busts begin with c.500 B.C., and the earliest are ideal heads of athletes; each century is represented with exquisite works; the ages of Polyclethus, of Praxiteles, of Lysippus. The masterpieces are perhaps some large heads of royal personages of the Alexandrian age, supposed to represent some of the Ptolemies, the so-called "Plato," "Berenice," and "Seneca." In the set of miniature busts, for the decoration of library or *lararium*, are a number of great philosophers and orators, some inscribed with their names.

The great period of portraiture closes with Septimius Severus and Caracalla, at the beginning of the third century A.D., and the decadence is then continuous to the time of Justinian in the sixth century, when busts ceased to be executed. It remained apparently a lost art until the thirteenth century. Then, curiously enough, a proto-Renaissance in southern Italy, under Frederick II, included the revival of portraiture in the form of busts, such as those of Frederick himself, and of his ministers, evidently imitated from the antique. The art of the fifteenth century was so thoroughly humanistic that portraiture was one of its favorite modes of expression. The permanent resurrection of the bust was then effected by Donatello, who was equally successful in his portraits of men, which were forceful, of women, which were graceful, and of children, where the real child-type was for the first time expressed in art with perfect mastery. The Florentine school continued in this new field. Desiderio da Settignano and Mino da Fiesole were especially successful. In the sixteenth century the Lombard school of portraiture was more realistic, especially the branch established at Modena, which was partial to terra cotta and colored busts. The fashion then spread to other nations.

During the succeeding Baroque and Rococo periods there was an even larger volume of production, varied and usually pictorial in character. The later eighteenth century saw the development of admirable realistic portraiture in the works of Houdon and his contemporaries. It was the endeavor during the early nineteenth century to attain the nearest correspondence with the antique. Busts have continued to be a popular form of portraiture. A celebrated collection of modern busts was gathered by Ludwig I of Bavaria in the Walhalla near Regensburg. In most recent years the tendency, especially in France and Italy, has been towards pictorial and even eccentric treatment. Busts are frequently represented as though they were parts of the unhewn stone or fragments of statues. During the classicist period of American sculpture they were much in vogue, and the production is still extensive. An enumeration of con-

BUSTARDS



1. GREAT BUSTARD (*Otis tarda*).
 2. HOUBARA (*Otis macqueeni*).
 3. SUN BITTERN (*Eurypyga heliae*); nuptial display.

4. THICK-KNEE OR STONE CURLEW (*Edionemus edionemus*).
 5. KAGU (*Rhinoceros jubatus*).
 6. LITTLE BUSTARD (*Otis tetrax*).

temporary sculptors successful with the bust would be a list of the most prominent of present-day sculptors. A few indeed, like Herbert Adams, have specialized in this important branch of sculpture.

Bibliography. Consult in general the article **SCULPTURE**. Among published sets of illustrations reproducing ancient busts was the *Virum Illustrum Imagines* of Fulvio Orsini (Rome, 1569; Antwerp, 1606). The first scientific classification was by Visconti (q.v.) in his *Iconographie grecque* (Paris, 1811) and *Iconographie romaine* (Paris, 1817). Consult also Bernouilli, *Die erhaltenen Bildnisse berühmter Griechen* (Basel, 1877); *Römische Ikonographie* (Stuttgart, 1882-94). The *Corpus* for this subject will be Brunn and Arndt, *Griechische und römische Porträts* (Munich, 1891 et seq.), a large folio publication, and for the portraits of the Italian Renaissance Bode's folio work, *Die Denkmäler der Renaissance-skulptur Toskanas* (Munich, 1892 et seq.). For the modern period, consult the histories of Italian, French, German, British, and American sculpture in the bibliography of **SCULPTURE**.

BUSTAMANTE, bō'stā-mān'tā, ANASTASIO (1780-1853). A Mexican politician. He was born in Jiquilpan (Michoacán), Mexico, became a physician, and joined the militia in 1808. He was among the earliest supporters of Iturbide when the revolt against Spain began in 1821. When Iturbide was overthrown in 1823, Bustamante went into retirement, but in 1829 he was chosen Vice President of the republic, exercising the full powers of President. He resigned when Santa Anna's revolution of 1832 proved successful, and the next year was exiled, living in Europe until 1836. After the downfall of Santa Anna, in 1836, he was recalled and in 1837 was elected President. After a prosperous administration he was compelled by disturbances to resign the presidency in favor of Santa Anna in 1839 and again went to Europe, returning in 1845. He participated in the war with the United States.

BUSTAMANTE, bō'stā-mān'tā, CARLOS MARÍA DE (1774-1848). A Mexican historian, soldier, and statesman, born at Oaxaca. In 1812 he commanded a regiment under Morelos in the first Mexican war for independence, at the end of which he was taken prisoner by the Spaniards and condemned to residence in the city of Vera Cruz. From that point he aided powerfully the declaration of independence in Iguala. He cast his lot with Santa Anna, becoming a secretary of that movement, and in 1821 marched with Santa Anna to the capital. From 1805 he was editor of the *Diario de Méjico*. He founded a weekly newspaper, *La Avispa de Chilpancingo*, whose articles twice led to his imprisonment. In answer to attacks he published in 1833 a biographical sketch of himself called *Hay tiempos de hablar y tiempos de callar*. He wrote several works of value for the study of modern Mexican history. These include: *Cuadro histórico de la revolución mexicana* (2 vols., 1823; 6 vols., 1843-46); *Historia del Emperador Don Agustín de Iturbide*; and *El nuevo Bernal Díaz del Castillo, Historia de la invasión de los Anglo-Americanos en Méjico* (1847); *Diario histórico de Méjico* (1896).

BUSTAN, bō'stān' (Pers. bū, fragrance + stān, place; cf. Afghanistan, Baluchistan, Kurdistan, etc.). The title of a number of Persian works, the best known of which is by Sadi

(q.v.). The term means literally a flower garden and suggests our own use of the word "anthology," i.e., a collection of beautiful writings.

BUSTARD (variant of bistard, OF. *bistarde*, *oustarde*, from Lat. *avis tarda*; *avis*, bird, *tarda*, slow). One of the large game birds of the Old-World family Otidae, which partakes of the characteristics of both the cranes and the plovers. They inhabit open country, being partial to the steppes of Russia and southwestern Asia and to the plains of Africa, and are both swift runners and powerful on the wing, although the species vary in their liking for flight. The great bustard (*Otis tarda*), extinct in Great Britain, but found in open regions "from Spain to Mesopotamia," is a large bird, weighing from 25 to 30 pounds ordinarily, gay in color, with wings strongly marked with black and white, and the back, shoulders, and breast (of the male) ornamented with russet, bay, and black. It feeds mainly on leaves, buds, fruits, etc., but seems to take insects, worms, or anything edible it meets. Its flesh is tender, and it is regarded as a first-class game bird. The little bustard (*Otis*, or *Tetrao*, *tetrao*) is a smaller and more handsome species, inhabiting both shores of the Mediterranean. The houbaras (*Houbaropsis bengalensis* and *Houbara*, or *Otis*, *macqueeni*) range from Morocco to India and form the favorite game birds of the Asiatic plains, where they are much hunted on camel back, the sportsman so mounted being able to get near a flock that would take early alarm at his approach on foot. The Anglo-Indian name, "florian," is applied to several smaller Indian species, and those of the South African plains are called "knoorhaans" by the Dutch and English colonists. Australia possesses a species, but none occur in the New World, so that the distribution, as well as the ornithological affinities of these birds, is very puzzling. A structural point of interest is the presence in several species of a highly distensible gular pouch, with an opening under the tongue, concerning which much speculation has been indulged in. Stejneger is no doubt right in declaring that it is simply a secondary sexual character, for display in courtship, comparable to that of the pectoral sandpiper. From their inability to breed readily in confinement attempts to domesticate these birds have failed, although individuals may easily be tamed. Certain other birds are erroneously called "bustards"; as the Magellanic goose of Argentina. Consult Chapman and Buck, *Wild Africa* (London, 1893). See Plate of **BUSTARDS**.

BUSTARD QUAIL (Anglo-Indian). See **BUTTON QUAIL**.

BUSTO-ARSIZIO, bō'stō ār-sēd'zē-ō. A city in north Italy, 21 miles northwest of Milan (Map: Italy, C 2). The church, which was designed by Bramante, contains frescoes by Gaudentio Ferrari. The town has manufactures of cotton goods and a trade in wine. Pop., 1881, 13,000; 1901, 19,673; 1911, 25,992.

BUSULUK, bō'soolook'. See **BUZULUK**.

BUSYBODY, THE. The nom de plume signed by Benjamin Franklin to a series of papers written in the manner of Addison's *Spectator*. They appeared at the time of his purchase of the *Philadelphia Gazette*.

BUSYBODY, THE. A comedy by Mrs. Centlivre, produced at Drury Lane, May 12, 1709, and published in quarto the same year. It is partially founded on Jonson's *The Devil is an Ass* and first introduces the famous character of

Marplot, after which the sequel of the play, produced at Drury Lane, Dec. 30, 1710, and printed in quarto 1711, is called. Henry Woodward produced a revision of the latter play under the title of *Marplot in Lishon*.

BUTADES. A Greek potter of Sicyon, probably before 600 B.C. A clay relief dedicated by him at Corinth was believed to be the first ever made. According to the legend, Butades, seeing on a wall in Corinth, whither he had removed from Sicyon, a drawing in outline by his daughter of her lover, molded the face in clay and baked it with the tiles which it was his business to make. This raised relief, and also the relief formed by pressing in the background with a stamp, were first used to ornament the ends of roof tiles and later for other purposes.

BUTANE (from Lat. *butyrum*; see BUTTER) and **ISOBUTANE.** Two gaseous compounds of carbon and hydrogen similar to marsh gas. They are isomeric, i.e., they have the same molecular formula (C_4H_{10}), yet differ in their physical and chemical properties. Butane is one of the gases found dissolved in crude petroleum.

BUTCHER, SAMUEL HENRY (1850-1910). A British classical scholar. He was born in Dublin, became a fellow of Trinity College, Cambridge (1874-76), and fellow and lecturer in University College, Oxford (1876-82). He was professor of Greek at the University of Edinburgh in 1882-1903. In 1904 he was lecturer at Harvard and in 1906 was elected to Parliament for Cambridge University. With Andrew Lang, he prepared an admirable prose translation of the *Odyssey* (1879). He also published: *Demosthenes* (1881); *Some Aspects of the Greek Genius* (1891); *Aristotle's Theory of Poetry and the Fine Arts, with a Critical Text and Translation of the Poetics* (1895); *Harvard Lectures* (1904).

BUTCHER BIRD. A shrike, so called from its habit of hanging up on thorns, fence posts, etc., the animals it captures for food. A belief in Europe that these victims numbered nine in each place gave it the German name "nine-killer." See **SHRIKE**.

BUTCHER'S BROOM. See **BRÖOM**.

BUTE, büt (from Gael. *buth, both, but*, dwelling, Eng. *booth*, referring to the cell of St. Brandon). An island in the Firth of Clyde, forming, with Arran, 5 miles southwest, and some smaller islands, the county of Bute, Scotland (Map: Scotland, C 4). It is separated from the coast of Argyre by a strait less than 1 mile wide, called the Kyles of Bute. It is about 16 miles long, from $1\frac{1}{4}$ to $6\frac{1}{4}$ miles broad, with an area of 60 square miles. The surface to the north is high, rugged, and barren; in the centre and south, low and undulating and comparatively fertile. The highest point rises 875 feet. The coast is rocky and has some bays. The island has several small lakes. The climate is milder than in any other part of Scotland and is much resorted to by invalids. The chief town is Rothesay (q.v.). Most of the island belongs to the Marquis of Bute, whose beautiful seat, Mount Stuart, is about 4 miles south from Rothesay. Among its antiquities are Rothesay Castle, Kames Castle, Kilmorie Castle, St. Blaine's Chapel, Dungyle, a remarkable vitrified fort on a high crag on the southwest coast, and the Devil's Caldron, a circular erection, the original purpose of which is unknown. Bute and the neighboring isles were for many centuries subject to the Norwegians. Pop., 1891, 11,740;

1901, 12,174; 1911, 11,835. Consult Hewison, *The Isle of Bute in the Olden Time* (Edinburgh, 1893-95).

BUTE, JOHN STUART, third EARL OF (1713-92). A British statesman whom Wilkes reviled, at whom Junius thundered, and against whom Chatham declaimed as "one behind the throne greater than the throne itself." He was born in Edinburgh, May 25, 1713, and succeeded to the peerage in 1723. He was educated at Eton and early showed a taste for mathematics, mechanics, and natural science, especially botany. About 1747 he attracted the favorable notice of Frederick, Prince of Wales, who appointed him a lord of the bedchamber. After the death of the Prince he became groom of the stole to his son, afterward George III, over whose mind he obtained a strong influence. In March, 1761, he became Secretary of State, and was Premier from May, 1762, to April, 1763. The chief events of his period of influence were the fall of Chatham in October, 1761, the rupture of the subsidy treaty with Prussia, a Spanish war in 1762, the negotiation of the Peace of Paris, and the levying of an ill-advised cider tax in 1763. His government was one of the most unpopular that ever held office in Britain, its fundamental principle being royal autocracy, with an executive government of obedient servants. In peril from mob violence, he resigned, but was always hated for his influence over the King. He devoted himself to the scientific pursuits which had early attracted him; was a liberal patron of literature and art and left an immense library, a fine collection of astronomical and philosophical instruments, and a gallery of splendid pictures, preserved to this day. He died March 10, 1792, in his seventy-eighth year, from the effects of a fall from a cliff while botanizing. Consult A. von Ruville, *William Pitt and Gref Bute* (Berlin, 1895), and Lovat-Fraser, *John Stuart, Earl of Bute* (New York, 1912).

BUTEA (Neo-Lat. from John, Earl of Bute). A genus of plants of the family Leguminosae. The best-known species are *Butea frondosa* and *Butea superba*, natives of India; the former is very widely distributed throughout that country, generally appearing as a sort of shrub in the neighborhood of villages, but in the jungles growing into a small tree. These trees present a gorgeous sight when covered with racemes of large, deep-scarlet flowers. They have trifoliate leaves, with roundish leaflets, velvety beneath. They yield a resinous exudation, which occurs in the form of lurid red tears, often covering the twigs, and is one of the kinds of lac brought to the market in India. *Butea frondosa* is called the Dhak or Pulas tree in India. The bark and roots are very fibrous, and the strong fibre is used for calking boats, rope making, etc. The flowers, called teesoo or keesoo, yield a beautiful yellow or orange dye. The gum exuded by *Butea frondosa* is said to contain more than 70 per cent tannin.

BUTESHIRE, büt/shär. A county in the west midland division of Scotland, comprising the isles of Bute (q.v.), Arran (q.v.), and the Cumbræes, Holy Isle, Pladda, Inchmarnoch, and other smaller islands (Map: Scotland, C 4). Area of the whole, 219 square miles, of which about one-sixth is cultivated. Agriculture and fishing are the only important occupations. The county town is Rothesay, in the island of Bute. Pop., 1901, 18,787; 1911, 18,186.

BUTLER. A city and the county seat of

Bates Co., Mo., 73 miles south by east of Kansas City, on the Missouri Pacific Railroad (Map: Missouri, B 3). It is the centre of a rich coal-mining and farming region. The sewage works and electric light plant are owned by the city. Pop., 1900, 3158; 1910, 2894.

BUTLER. A borough and the county seat of Butler Co., Pa., on Conequenessing Creek, 31 miles north of Pittsburgh, and on the Pennsylvania, the Pittsburgh and Western, the Buffalo, Rochester, and Pittsburgh, and the Bessemer and Lake Erie railroads (Map: Pennsylvania, B 5). The surrounding country is rich in oil, natural gas, coal, and iron. The principal industrial establishment is a steel-car works. Glass manufacture, including bottles and plate glass, is also an important industry; and there are planing mills, large flour mills, and manufactories of silk, carriages, white lead, pearl buttons, brass and iron beds, and oil-well tools. Butler has a fine courthouse, a hospital, several parks, and a public library. Settled about 1798, Butler was first incorporated in 1803. It is governed by a burgess, elected for three years, and a borough council. Pop., 1910, 20,728; 1920, 23,778.

BUTLER, ALBAN (1711-73). An English hagiographer. He was educated at the English Roman Catholic College in Douai, where upon ordination to the priesthood he was elected professor of philosophy and afterward of divinity. He traveled on the Continent, was chaplain to the Duke of Norfolk, and was president of the English College of St. Omer, where he died. His great work, the *Lives of the Saints* (4 vols., 1756-59), required 30 years for its completion and shows vast erudition and research. The second edition (with previously omitted notes) was published in 12 vols. after his death.

BUTLER, AMOS WILLIAM (1860-). An American anthropologist and ornithologist, born at Brookville, Ind. He was educated at the University of Indiana, at Bloomington; was one of the founders of the Indiana Academy of Science, and in 1895 was elected its president. From 1896 to 1897 he was ornithologist to the State Department of Geology and Natural Resources of Indiana. He was president of the National Conference of Charities in 1906-07 and of the American Prison Association in 1909-10. His publications include: *The Birds of Indiana* (Indianapolis, 1891), and about 100 papers on natural history and sociological subjects, which have appeared in the publications of scientific societies.

BUTLER, ANDREW PICKENS (1796-1857). An American politician. He graduated at South Carolina College and in 1817 became a lawyer. He served in the Legislature in 1824, and in 1833 was appointed judge of the Circuit and Supreme Courts. In 1846 he was appointed United States Senator and served as such until his death. It was Sumner's reply to Butler's last speech that led to the assault upon the former by Preston S. Brooks (q.v.).

BUTLER, ARTHUR JOHN (1844-1910). An English scholar. He was educated at Eton and at Trinity College, Cambridge. From 1870 to 1887 he was employed in the Education Department of the government and then was engaged in the publishing business until he became in 1894 assistant commissioner to the Commission on Secondary Education. Besides editing Dante's *Divina Commedia*, and the *Memoirs of General Marbot* and of General Thiebault, and translating Scartazzini's *Dante-Handbuch*, he published

Dante: His Times and Work; Life and Letters of his father, W. J. Butler, with his sister Mrs. Knight (1898); *The Forerunners of Dante* (1910).

BUTLER, BENJAMIN FRANKLIN (1795-1858). An American lawyer and politician. He was born at Kinderhook Landing, N. Y., received a district-school education, studied law, and was admitted to the bar in 1817. He was a partner of Martin Van Buren until 1821 and gained rapid eminence in his profession. In 1825-27 he was associated with Messrs. Duer and Spencer on the commission to revise the statute laws of the State. He was elected to the State Legislature in 1827, was the representative of New York on the commission which in 1838 readjusted the New York-New Jersey boundary; was Attorney-General in the cabinet of Jackson from 1833 to 1837, and in that of Van Buren from 1837 to 1838; and from October, 1836, to March 4, 1837, acted also as Secretary of War. From 1838 to 1841 he was district attorney for the United States at New York City; in 1844 he was at the head of the Electoral College in New York; and from 1845 to 1848 he was again district attorney, having declined the position of Secretary of War in President Polk's cabinet. He organized the department of law in the College of the City of New York and for some time was the principal professor. After 1848 he devoted himself wholly to his private practice and was engaged in several notable cases; but in 1858, owing to failing health, he visited Europe, and on November 8 died in Paris. As a lawyer he was recognized as one of the foremost members of the New York bar and practiced on equal terms with such men as Van Buren, Henry, Duer, Spencer, and Nelson. Chancellor Kent once said of him: "The student, in pursuing his studies, is surprised to find in all his books such vast and various memoranda of the professional labors of this remarkable lawyer." In politics he was for the greater part of his life an enthusiastic Democrat, but, disapproving of his party's attitude towards the Kansas-Nebraska Bill and the repeal of the Missouri Compromise, he joined the newly organized Republican party in 1856 and voted for Frémont. A number of addresses delivered by him before the New York Historical Society were published under the title *Outlines of the Constitutional History of New York* (1847). For a biographical sketch, consult *Proceedings and Addresses on the Occasion of the Death of Benjamin F. Butler* (New York, 1859).

BUTLER, BENJAMIN FRANKLIN (1818-93). An American lawyer, politician, and general. He was born in Deerfield, N. H., Nov. 5, 1818; graduated at Waterville College (now Colby University), Me., in 1838; was admitted to the bar in 1840, and began at Lowell, Mass., a practice which soon became large and gave him a wide professional repute. He entered political life as a Democrat, was sent in 1853 to the State Constitutional Convention and to the State Legislature, where he was instrumental in effecting the passage of a bill for reducing the hours of labor in factories from 13 to 11, and in 1859 was elected to the State Senate. He was a delegate to the National Democratic Convention at Charleston, S. C., in 1860, and to the subsequent convention at Baltimore, and was among those who withdrew from the latter. In the same year he was an unsuccessful candidate for Governor of Massachusetts. Upon the outbreak of the Civil War he was a brigadier general of the

State militia. After taking possession of Annapolis he occupied Baltimore without opposition, and in May, 1861, was made a major general of volunteers and put in command of the Department of Eastern Virginia, with headquarters at Fortress Monroe. While here he refused to surrender fugitive slaves who penetrated his lines and in this connection issued his famous order designating slaves as "contraband of war." After taking some part in the operations against the coast forts of North Carolina, he was sent, in the following spring, to Ship Island and up the Mississippi. When the expedition against New Orleans was organized, he was placed in command of the troops, and on May 1, 1862, after Farragut had run by Forts Jackson and St. Philip and had destroyed the Confederate fleet, Butler took possession of New Orleans, and instituted a vigorous administration which, though characterized by great ability and for the most part by good judgment, was warmly criticised. Especial notoriety attached to his "Order No. 28," issued after considerable provocation, in which he directed that any woman who should publicly insult United States officers should be "regarded and held liable to be treated as a woman of the town plying her avocation." The order aroused the intense anger of the South, where he came to be known as "Beast Butler." For this and other acts during his administration, President Jefferson Davis in December ordered by proclamation that Butler should be considered as a felon and an outlaw, and if captured should instantly be hanged. Butler's order also caused much indignation abroad, and especially in England, and for some time threatened seriously to compromise the relations between the British and American governments. Butler was relieved from his post by Gen. N. P. Banks (q.v.), in December, 1862, and towards the close of 1863 was made commander of the Department of Virginia and North Carolina, in which capacity, after being hemmed in for some time at Bermuda Hundred (q.v.), he co-operated in Grant's general movement against Petersburg. In October, 1864, he was temporarily put in command at New York City, in view of anticipated disturbances during the approaching election, and in the following December commanded an expedition against Fort Fisher. His conduct during this movement led to his removal by Grant, whose orders he had disregarded, and to the ending of his military career. Devoting himself thereafter to law and politics, he was elected to Congress as a Republican in 1866, remained a member during 10 of the following 12 years, took an active part in the debates over the various Reconstruction measures, and was one of the seven managers, for the House, of the impeachment trial of President Andrew Johnson. In 1871 he was the Republican nominee for Governor of Massachusetts, but was defeated. Having left the Republican party and allied himself with the Greenback and Labor movement, he became an independent Democratic candidate for Governor in 1878 and again in 1879, but was each time defeated. He acted regularly with the Democrats in the campaign of 1880 and was finally elected Governor by that party in 1882. In the following year he was defeated for the same office, and in 1884, refusing to be bound by the action of the Democratic National Convention, of which he had been a member, he accepted a presidential nomination from the Greenback-Labor and Anti-

monopolist parties, but was defeated in the ensuing election. He died suddenly at Washington, Jan. 11, 1893. He published *The Autobiography and Personal Reminiscences of Major General B. F. Butler: Butler's Book* (1892). Consult Parton, *Butler in New Orleans* (New York, 1863); Bland, *Life of Benjamin F. Butler* (Boston, 1879); Bruce, "General Butler's Bermuda Campaign," in *Military Historical Society of Massachusetts, Papers*, vol. ix, pp. 301-346 (Boston, 1912). On Butler's interest in corrupt trade at New Orleans and in the illicit trade in the Department of Virginia, consult Rhodes, *History of the United States, from the Compromise of 1850*, vol. v.

BUTLER, CHARLES (1750-1832). A prolific English writer, nephew of Alban Butler (q.v.). He was educated at Douai, was entered at Lincoln's Inn in 1775, and first practiced as a conveyancer, but was regularly called to the bar in 1791, when the disability under which the Roman Catholics suffered was removed. Throughout his life he labored earnestly for the repeal of the law against English Catholics. His literary activity was enormous. The most important of his works are: *Reminiscences* (1821-27); *Horæ Biblicæ* (1797); *Book of the Roman Catholic Church* (1825); and biographies of Erasmus, Grotius, Fénelon, Bossuet, Alban Butler, and others. He also published a continuation of his uncle's *Lives of the Saints* and completed Hargrave's edition of *Coke upon Littleton*. Consult Stoddard, *Life and Letters of Charles Butler* (New York, 1903).

BUTLER, CHARLES (1802-97). An American lawyer and philanthropist. He was born at Kinderhook Landing, Columbia Co., N. Y.; studied law in the office of Martin Van Buren at Albany, N. Y.; was admitted to the bar in 1824, became assistant district attorney of Genesee County, and, as agent of the New York Life Insurance and Trust Company, was influential in building up the western part of the State. He obtained extensive interests in land on the site of the present cities of Chicago, Ill., and Toledo, Ohio, and by this means, by large railway investments, and by his adjustment of the State debts of Indiana, Michigan, and Illinois, accumulated a fortune. In 1835 he was a founder of the Union Theological Seminary, New York City, and in 1836 was appointed to the council of New York University, of which he was long president.

BUTLER, CLEMENT MOORE (1810-90). A Protestant Episcopal clergyman, born in Troy, N. Y. He graduated at Trinity College in 1833, and at the General Theological Seminary in 1836, and was rector of churches in Boston and Washington, and, from 1862 to 1864, of Grace Church, Rome, Italy. For the next 20 years he was professor of ecclesiastical history in the Protestant Episcopal Theological School, Philadelphia. He published: *The Book of Common Prayer Interpreted by its History* (1846); *Old Truths and New Errors* (1850); *St. Paul in Rome* (1865); *Inner Rome* (1866); *Manual of Ecclesiastical History* (2 vols., 1868-72).

BUTLER, ELLIS PARKER (1869-). An American humorist, born in Muscatine, Iowa. His great success, *Pigs is Pigs* (1906), was followed by other brilliantly ludicrous stories, including *The Incubator Baby* (1906); *The Great American Pie Company* (1907); *The Cheerful Smugglers* (1908); *A Thin Santa Claus* (1909); *Adventures of a Suburbanite* (1911). *The Jack-Knife Man* (1913) attains the length of a novel.

He wrote humorous verse also, and, presumably in a different vein, *French Decorative Styles*.

BUTLER, HENRY MONTAGU (1833-). An English clergyman and educator, born at Gayton, Northamptonshire. He studied at Trinity College, Cambridge, and was head master of Harrow School from 1859 to 1885. In 1885-86 he was dean of Gloucester and in 1897 was appointed honorary canon of Ely. He became master of Trinity College, Cambridge, in 1886, and was vice chancellor in 1889 and 1890. He was appointed chaplain in ordinary to the King in 1912. His published works, consisting chiefly of volumes of sermons, include: *Sermons Preached in the Chapel of Harrow School* (1861); a second series in 1866); *Belief in Christ, and Other Sermons* (1898); *Words of Good Cheer for the Holy Communion* (1898); *University and Other Sermons* (1899); *Ten Great and Good Men* (1909); *Lord Chatham as an Orator* (1912).

BUTLER, HOWARD CROSBY (1872-1922). An American professor of architecture, born at Croton Falls, N. Y. He was educated at Princeton University, at the Columbia School of Architecture, and at the American schools of Classical Studies in Rome and in Athens. He led three archaeological expeditions in Syria (1899, 1904, and 1909). In 1905 he became professor of the history of architecture at Princeton. His publications include: *Scotland's Ruined Abbeys* (1899); *The Story of Athens* (1902); "Architecture," part ii of the *Publications of the American Archaeological Expedition to Syria* (1903).

BUTLER, HOWARD RUSSELL (1856-). An American landscape and marine painter, and also a lawyer. He was born in New York, March 3, 1856, graduated at Princeton College, 1876, and at the Columbia Law School, 1881. He practiced law in 1881-84, then took up painting and studied at the Art Students' League, New York, and with Dagnan-Bouveret, Roll, and Gervex in Paris. It was largely due to his efforts that the home of the Fine Arts Society, of which he was president from 1889 to 1906, was built in 57th Street, New York. His pictures are principally marine views and stretches of beach and surf. Among the best are "The Sea," "The Breakers," "Maine Coast," "Sunrise," "Sea Puss," and "Sunset," York Heights. He was elected to the National Academy in 1902.

BUTLER, JAMES. See ORMONDE.

BUTLER, JAMES GLENTWORTH (1821-). An American clergyman of the Presbyterian church. He was born in Brooklyn, N. Y., studied at Yale, the Union Theological Seminary, and Yale Divinity School, and from 1852 to 1863 was pastor in West Philadelphia, Pa. From 1868 to 1871 he was secretary to the American and Foreign Christian Union of New York City and from 1871 to 1873 was pastor in Brooklyn, N. Y., Eastern District. Subsequent to 1874 he was occupied wholly with literary work, in particular with the preparation of his commentary, *Bible Work* (11 vols., 1874-94); *Vital Truths Respecting God and Man* (1904); *Present-Day Conservatism and Liberalism* (1911).

BUTLER, JOHN (?-1794). A Tory leader in the American Revolution. He was born in Connecticut, but early became a resident of Tryon Co., N. Y. He commanded the Indians in Sir William Johnson's Niagara campaign of 1759 and in the Montreal expedition of 1760; joined the British at the beginning of the Revolution, and led many Indian and Tory expedi-

tions against the frontier settlements, making himself notorious by his numerous cruelties and atrocities. At the battle of Oriskany (q.v.) in 1777, he commanded a company of Indians and Tories organized by himself and in 1778 led the force of 1100 which devastated the Wyoming valley and massacred the inhabitants. (See WYOMING VALLEY.) He fought against Sullivan in 1779, when that officer made his famous expedition against the Iroquois in New York, and the following year engaged in Sir John Johnson's raid against the Schoharie and Mohawk settlements. At the close of the war he settled in Canada, where until his death he was an agent for Indian affairs.

BUTLER, JOSEPH (1692-1752). An English theologian, born at Wantage, in Berkshire. With a view to the ministry of the Presbyterian church, he attended a Dissenting academy at Tewkesbury in Gloucestershire. At the age of 21 he gave proof of high metaphysical ability in a letter to Dr. Samuel Clarke, usually appended to that celebrated writer's a priori demonstration, to which it offers some objections. About this time he made up his mind to join the Church of England, and in March, 1714, entered Oriel College, Oxford. In 1718 he graduated and, having taken orders the following year, was appointed preacher at the Rolls Chapel, where he preached those remarkable sermons which he published in 1728. The first three, "On Human Nature," constitute very important contributions to moral science. Against hedonism (q.v.) he urges that before one can find pleasure in an object one must have a disinterested desire for the object. Hence disinterested benevolence is possible. Indeed, it is one among many impulses of human nature, which is a system of impulses, each having its own right. Butler sometimes represents conscience as the supreme regulative principle, controlling all the other impulses; sometimes reasonable self-love and benevolence are coördinate and harmonious supreme principles; sometimes to self-love is attributed the final word in the (for him impossible) case of a conflict between self-love and benevolence. Just what conscience is for Butler it is hard to ascertain. In 1725 Butler was presented to the rich benefice of Stanhope in the county of Durham, to which he removed in the following year. Here he resided in great retirement till 1733. Thomas Secker, afterward Archbishop, desired to see him promoted to some more important position and mentioned his name once to Queen Caroline. The Queen thought he had been dead and asked Archbishop Blackburne if it were not so. "No, madam," said the Archbishop, "but he is buried." In 1733 Butler became chaplain to his friend, Lord Chancellor Talbot, and some time afterward a prebendary of Rochester. In 1736 he published *The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature*. Although the argument is ingenious and for a century and a half has been praised in the highest terms, it cannot be said to have any logical value. The leading aim of the *Analogy* is to show that all the objections to revealed religion are equally applicable to the whole constitution of nature, and that the general analogy between the principles of divine government, as revealed in the Scriptures, and those manifested in the course of nature, warrants the conclusion that they have one author. Soon after the publication of this work Butler was appointed Clerk of

the Closet to the Queen, who greatly prized his conversation. In 1738 he was made Bishop of Bristol, in 1740, dean of St. Paul's, and in 1750 he was translated to the see of Durham. He lived to make but one visitation of his diocese. His "charge" on the occasion, in which he emphasized the importance of a due maintenance of the externals of religion, subjected him to much censure as betraying a tendency to Roman Catholicism. In character Butler was grave and judicious, meek and generous. His episcopal treasures were wisely and munificently distributed. His works, with a *Life* by Kippis and notes by Halifax, were collected and published at Edinburgh (1804) and reprinted at Oxford (1807); a sumptuous edition, with "studies," was published by W. E. Gladstone in 1896. There are good separate editions of the *Analogy* and of the *Three Sermons*. Consult: Collins, *Butler* (London, 1889); Lefevre, "Significance of Butler's View of Human Nature," in *Philosophical Review* for 1899; Spooner, *Bishop Butler* (Boston, 1901); Taylor, *Ethical and Religious Theories of Bishop Butler* (Toronto, 1903).

BUTLER, MARION (1863-). An American legislator, born in Sampson Co., N. C. He was admitted to the bar in 1889 and engaged in practice in Raleigh and Washington. While a member of the North Carolina Senate (1890) he drafted the State railways commission law. In 1892, leaving the Democrats, he assisted in organizing the Populist party and was chairman of the National Executive Committee of that party from 1896 to 1904. A United States Senator in 1896-1901, he was author of the bill establishing the rural free delivery in the postal service, and he secured the first favorable report on the bill to establish postal savings banks. Subsequent to his defeat for reelection to the Senate he became affiliated with the Republican party.

BUTLER, MATTHEW CALBRAITH (1836-1900). An American soldier and politician. He was born near Greenville, S. C., and spent two years at the South Carolina College. He entered the Confederate army as a captain in 1861 and attained the rank of brigadier general in 1862 and of major general in 1863. In 1863, at the battle of Brandy Station, he lost his right leg. He was elected to the State Legislature in 1866, and from 1877 to 1889 was a Democratic member of the United States Senate. In 1898 he was appointed major general of volunteers for service in the Spanish-American War and in the same year was a member of the commission appointed to arrange for the evacuation of Cuba by the Spanish forces.

BUTLER, NICHOLAS MURRAY (1862-). An American educator, author, and publicist, born in Elizabeth, N. J. He entered Columbia College in 1878 and graduated with the highest honors in 1882. As a student he showed great versatility and also accuracy in scholarship, so that he was no less distinguished for his proficiency as a classicist than as a mathematician. From 1882 to 1884 he was a fellow in philosophy, spending a third year of advanced study in Berlin and Paris. Returning to Columbia in 1885, he became assistant in philosophy and, later, full professor of philosophy, ethics, and psychology. When Columbia College was reorganized as a university, Dr. Butler was chosen as the first dean of the faculty of philosophy, ethics, and psychology (1890). In 1887 he had

organized the New York College for the Training of Teachers (now Teachers College, affiliated with Columbia University). In 1891 he founded the *Educational Review*, of which he has since remained the editor, and he has also edited the *Great Educators Series*, the *Teachers' Professional Library*, and *Columbia University Contributions to Philosophy and Education*. In 1894 he was elected president of the National Educational Association. Upon the resignation of Hon. Seth Low from the presidency of Columbia University in 1901, he became acting president and soon afterward president. In his administration of this onerous office he has shown marked ability as a masterful executive, his scope of interest embracing not only the minute details of educational activity, but the broader relations of university work to public life. He is remarkable for his retentive memory, his firm grasp of complicated problems, and his boldness and originality in their solution. He has also made himself a prominent figure in Republican national politics, and in 1912 he received the electoral vote of Utah and Vermont for the office of Vice President of the United States after the death of James S. Sherman, who had been chosen as the so-called "running mate" of William H. Taft.

Dr. Butler is the author of many addresses, papers, essays, and reviews, some of which have been published under the titles: *The Meaning of Education* (1898); *Education in the United States* (2 vols., 1900); *True and False Democracy* (1907); *Philosophy* (1908; 3d ed., 1911); *The American as He Is* (1908); *The International Mind* (1912); *Why should we Change our Form of Government?* (1912); and *What is Progress in Politics?* (1913). He was chairman of the Lake Mohonk Conference on International Arbitration in 1907, 1909, 1910, and 1912. He was chosen a member of many learned societies, including the American Academy of Arts and Letters. He has been decorated by the French government and by the German Kaiser, and has had honorary degrees conferred upon him by several foreign universities, among them the University of Cambridge. He is president for the United States of L'Association pour la Conciliation Internationale.

BUTLER, PIERCE MASON (1798-1847). An American soldier and politician. He was born in South Carolina, entered the army as second lieutenant of infantry in 1819, and became captain in 1825. He resigned his commission in 1829, and was president of a bank in Columbia, S. C., from 1829 to 1836, but served as lieutenant colonel during the second Seminole War. He became Governor of the State in 1838 and after the expiration of his term was Indian agent until the beginning of the Mexican War. He then was appointed colonel of the Palmetto Regiment, and in this capacity served with great gallantry in several engagements, but was killed at the battle of Churubusco, Aug. 20, 1847.

BUTLER, SAMUEL (1612-80). An English satirist. He was baptized at Strensham, Worcestershire, Feb. 8, 1612, and educated at the Worcester Grammar School. It is a tradition that he also attended one of the universities, most likely Cambridge. When a young man, he entered the household of the Countess of Kent, where he became acquainted with Selden. He also studied painting at this time. Leaving the service of the Countess, he became attendant to a succession of country gentlemen. During this

period he wrote much of *Hudibras*, the hero of the poem being one of his masters—Sir Samuel Luke, of Cople Hoo, near Bedford. In 1660 he was made secretary to the Earl of Carbery, who appointed him steward of Ludlow Castle. Soon after he married a woman of good family and some property, which, however, was lost in bad securities. He published the first part of *Hudibras* in 1663, and its reception at court was immediate and triumphant. Then the coffeehouses and taverns took up the poem. Though the King had wit enough to see the merit of the work, he lacked generosity to relieve the necessities of the writer. Poverty is almost the only thing in Butler's life that one is certain of. In 1664 he published the second part of his book, and a third part appeared in 1678. He died in Rose Street, Covent Garden, Sept. 25, 1680.

Hudibras is a kind of metrical *Don Quixote*. The Puritans are the subject of ridicule, and King Charles must have felt that the poet avenged for him the battle of Worcester. Butler thinks in witty couplets, he argues in them, he spears his foes with a jest, he routs and chases them into oblivion with inextinguishable laughter. His best things have become proverbs. In 1759 appeared *The Genuine Remains, in Prose and Verse, of S. Butler*, collected by R. Thyer (London), which contains a series of character sketches and much brilliant satire in the manner of *Hudibras*. Consult the new edition of *Hudibras*, in Morley's Universal Library (London, 1894), and *Poetical Works*, edited by Johnson (London and New York, 1893). The best and most careful reprint of the lines of *Hudibras* is that of Waller (1905). See SATIRE.

BUTLER, SAMUEL (1835-1902). An English author, born at Langar, Nottinghamshire, educated at St. John's College, Cambridge, and early a sheep rancher in New Zealand. He was a painter, composer, scholar, and writer in many fields, but above all a powerful satirist. His works include: *A First Year in Canterbury Settlement* (1863); *Erewhon, or Over the Range* (1872); *The Fair Haven* (1873); *Life and Habit* (1878); *Evolution, Old and New* (1879); *Unconscious Memory* (1880); *Luck, or Cunning?* (1887); *The Alps and Sanctuaries of Piedmont and the Canton Ticino* (1882); *Ex Voto* (1888); *The Authoress of the Odyssey* (1897); *Shakespeare's Sonnets Reconsidered* (1899); *Erewhon Revisited* (1901). Since Butler's death have appeared *The Way of All Flesh* (1903), a novel; *Essays on Life, Art, and Science* (1904); *Note Books* (1912); *The Humor of Homer and Other Essays* (1913). Consult studies by Gilbert Cannan (London, 1915) and J. F. Harris (ib., 1916).

BUTLER, WALTER. See WALLENSTEIN.

BUTLER, WILLIAM ALLEN (1825-1902). An American author, born in Albany, N. Y. He practiced law in New York City and wrote: "Nothing to Wear" (1857), a noted satirical poem; other verse; several biographical sketches; *Domesticus* (1886); *Mrs. Limber's Raffle* (1899); *Retrospect of Forty Years* (posthumous, 1911).

BUTLER, WILLIAM ARCHER (c.1814-48). An Irish moral philosopher and Anglican clergyman. He was born at Annervel and graduated at Trinity College, Dublin, where in 1837 he became professor of moral philosophy. His best-known works are the *Sermons, Doctrinal and Practical* (1849), and the eloquent *Lectures on the History of Ancient Philosophy* (1856).

BUTLER, SIR WILLIAM FRANCIS (1838-1910).

A British soldier, born in county Tipperary, Ireland. He was privately educated, entered the army, and rose to be lieutenant colonel in 1880. He served in the Ashanti War (1873-74), the Zulu War (1879), and the war in the Sudan (1884-85), and commanded the English troops at Alexandria in 1890-93. In 1898 he was in command of the army in South Africa and, in 1899, of the troops of the Western District. He was promoted in 1901 to be lieutenant general, and was appointed commanding officer at Aldershot. He published: *The Great Lone Land* (1872); *Far and Out* (1880); *Charles George Gordon* (1889); *Sir George Pomeroy Colley* (1899); *From Naboth's Vineyard* (1907); *The Light of the West, with Some Other Wayside Thoughts* (2d ed., 1910). Consult his Autobiography (New York, 1911).

BUTLER, WILLIAM ORLANDO (1791-1880). An American soldier and politician. He was born in Jessamine Co., Ky., early removed with his parents to Bullitt County, and in 1812 graduated at Transylvania University. On the outbreak of the War of 1812 he joined a company of Kentucky volunteers and subsequently participated in the engagements of Jan. 18 and 22, 1813, on the river Raisin. (See FRENCHTOWN.) He was held for some time as a captive, but afterward took an active part, as captain, in the engagement at Pensacola, in that of Dec. 23, 1814, at New Orleans (for which he was brevetted major), and in the famous battle of New Orleans, on Jan. 8, 1815. In May, 1817, he resigned from the service and returned to Kentucky, where he became a successful lawyer and politician. He served for three consecutive terms after 1817 in the State Legislature and from 1839 to 1843 was a member of Congress. In 1844 he was Democratic candidate for Governor of the State, and, though defeated, reduced the Whig majority from 28,000 to something over 4000. He was appointed major general of volunteers in June, 1846, for service in the Mexican War; joined General Taylor soon afterward; took part in the northern campaign, distinguishing himself particularly at Monterey, where he was wounded; joined General Scott at Mexico City, with a considerable reinforcement, and participated in the final operations of the southern campaign. On Feb. 18, 1848, nine days after the signing of the preliminary treaty with Mexico, and about three months before the proclamation of peace (on May 29), he superseded Scott as commanding general of the American army. On Aug. 15, 1848, he again left the service, and in the presidential campaign of that year he was the Democratic candidate for Vice President on the ticket with General Cass. Subsequently, until his death, he lived almost wholly in retirement, though in 1861 he attended the celebrated "Peace Conference" at Washington. He published a collection of poems entitled, *The Boatman's Horn and Other Poems*. For his life, consult Blair, *The Life and Public Services of General William O. Butler* (Baltimore, 1848).

BUTLER, ZEBULON (1731-95). An American soldier. He was born in Connecticut, served in the French and Indian War of 1755-63, and settled at Wyoming, Pa., in 1769. He was lieutenant colonel of the Connecticut troops in New Jersey in 1777-78, commanded the garrison of Fort Mifflin at the time of the Wyoming massacre (see WYOMING VALLEY), and in 1779 served in Sullivan's expedition against the Indians.

BUTLER COLLEGE. A coeducational institution at Indianapolis, Ind., chartered in 1849 as the Northwestern Christian University, the present title being assumed in 1896. It was founded by members of the Church of the Disciples of Christ, but is unsectarian. Its departments include an undergraduate college, a normal course, departments of art and ministerial education, a summer school and extension courses. In 1913 it had 543 students, 19 instructors, a library of 13,000 volumes, an endowment of \$395,000, an income of \$45,000, and property valued at \$212,000. President, Thomas C. Howe.

BUTLEROFF, бѹт'лѣр-ѡф, **ALEXANDER MIKHAILOVICH** (1828-86). A Russian chemist. He was born at Tschistopol (government of Kazan) and was educated at the University of Kazan, where, in 1858, he was appointed professor of chemistry. He also held the position of rector at that institution. In 1868 he was called in the same capacity to the University of St. Petersburg. Besides publishing a valuable work on the general principles of organic chemistry, Butleroff carried out a number of interesting original investigations. His best-known contribution to science was the discovery of the so-called tertiary alcohols (see *ALCOHOLS*), and of a general method by which the substances of this class may be readily prepared ("Butleroff's reaction"). His scientific papers may be found in the publications of the academies of St. Petersburg and Paris and in Liebig's *Annalen*. Butleroff was a strong believer in spiritualism and even published a work in French on this subject, entitled *Etudes psychiques*. He is also the author of an authoritative work in Russian on apiculture.

BUT'O (Gk. Βουρά, Βουτό). The Greek form of the Egyptian *Pe(r)-Uzoy(t)* (House of Uzoyt), the name of a city which in prehistoric times seems to have been the capital of Lower Egypt. The goddess Uzoyt, from whom the city took its name, was the patroness of the Delta. She is represented in the form of a serpent and was identified by the Greeks with Latona. The city of Buto appears to have been situated on an island of the modern Lake Burlos, but the exact location is unknown.

BUTON, bu-tōn', **BOETON**, or **BUTUNG**. An island of the Dutch East Indies situated southeast of Celebes, from which it is separated by Buton Strait (Map: East Indies, F 5). It is included between lat. 4° 25' and 5° 45' S. and long. 122° 32' and 123° 30' E. Area, about 1632 square miles. It has an elevated surface and is fertile and thickly wooded; the chief products are tropical fruits, rice, and maize. It is an administrative dependency of Celebes, but is governed by a native chief under a Dutch resident. The chief town is Buton, at the southwest extremity of the island. Pop., est. at 100,000, chiefly Malays.

BÜTSCHLI, but'shlē, **OTTO** (1848-). A German zoölogist, born in Frankfurt-on-the-Main. He studied at the Karlsruhe Technical School and at the University of Heidelberg, became a lecturer at the former (1876-78), and in 1878 was appointed professor of zoölogy at the latter. His early researches concerned the history of the evolution of gastropods, worms, and insects, and the anatomical structure of the nematodes and other worms. In his "Studien über die Zellteilung und die Konjugation der Infusorien" (in vol. x of the *Abhandlungen* of

the Sneckenberg Society, 1876) he was a pioneer in establishing modern scientific knowledge of nucleus and cell division. His studies of the constitution of protoplasm and the structure of bacteria have aroused wide scientific interest and discussion. His publications include an important volume on the "Protozoen" (constituting vol. i of Bronn's *Klassen und Ordnungen des Tierreichs*, 1880-89); *Untersuchungen über mikroskopische Schäume und das Protoplasma* (1892); *Untersuchungen über die Mikrostruktur künstlicher und natürlicher Kieselsäuregallerten* (1900); *Mechanismus und Vitalismus* (1901), *Untersuchungen über Amylose* (1903); *Vorlesungen über Vergleichende Anatomie* (1910).

BUTT, ARCHIBALD WILLINGHAM (1866-1912). An American army officer. He was born at Augusta, Ga., graduated at the University of the South, and for some time was engaged as a newspaper correspondent. In 1900 he received an appointment as captain of volunteers, and later, in the regular army, was quartermaster in the Philippines, at Washington, and at Havana. He was promoted to the rank of major in 1911. President Roosevelt chose him his personal aid in 1908, and, until his death in 1912, he bore the same relation to President Taft. He was drowned when the *Titanic* sank. In 1913 a fountain was erected to his memory in Washington.

BUTT, CLARA (1873-). An English contralto singer, born at Southwick, Sussex, England. In 1900 she married R. H. Kennerley Rumford, a popular baritone. She made her début in 1892 in a students' performance of Gluck's *Orfeo* at the Lyceum Theatre, presented before the Prince of Wales. Besides singing in many important festivals and concerts, she was honored with royal commands from Queen Victoria, King Edward VII, and King George. After completing her continental engagements, in 1912 she started on a tour around the world with her husband, and in 1913 she made her second appearance in New York, singing at Carnegie Hall. Madame Butt possesses a voice of astonishing range and power, but one which unfortunately has not received the training it deserves; consequently she is unable to realize to the full her possibilities.

BUTT, ISAAC (1813-79). An Irish politician and nationalist. He graduated at Trinity College, Dublin, in 1835; was elected professor of political economy there in 1836 and became a member of the Irish bar in 1838. He was one of the counsel for Smith O'Brien and others tried in 1848 for treason and also for the Fenians tried in 1865. In 1852 he was chosen to Parliament from Youghal as a Liberal Conservative and in 1871 was returned from Limerick and was for many years leader of the Home Rule party. In 1833 he was one of the founders of the *Dublin University Magazine*, of which he was editor from 1834 to 1838. Among his published works are a *History of Italy* (1860) and *The Problem of Irish Education* (1875).

BUTTE, büt (Fr. mound, hillock, elevation; cf. Eng. *butt*). A hill or knoll rising abruptly above the surrounding level. Buttes abound in the Rocky Mountain region. Often the name is applied to high mountains, as the Downieville Buttes, Sierra Co., Cal., which are over 8500 feet.

BUTTE. A city and the county seat of Silverbow Co., Mont., on the west slope of a

range of the Rocky Mountains, and on the Oregon Short Line, the Northern Pacific, the Great Northern, the Butte, Anaconda and Pacific, and the Chicago, Milwaukee and St. Paul railroads (Map: Montana, D 3). It has a healthful location at an altitude of 5800 feet, is the seat of the State School of Mines, and contains a fine public library, the beautiful Columbia Gardens, theatres, and among the more notable buildings, the jail and courthouse, the high school (completed at a cost of \$200,000), the city hall, Federal Building, and opera house. The famous Anaconda Copper Company's mines are situated here, and within a radius of a few miles are many other mines noted for their production of copper, with by-products of gold, silver, lead, and zinc, the industries of the city centering almost entirely in the mines and smelters situated at Anaconda and Great Falls. There are, however, some manufactures of macaroni, cigars, candy, caskets, and mattresses. In copper the production of Butte in 1912 was 24.8 per cent of the output of the United States and 13 per cent of that of the world, amounting to 308,000,000 pounds. The annual mineral production is valued at nearly \$60,000,000. The government of Butte is vested in a mayor, biennially elected, and a city council. The city was settled in 1864 and laid out in 1866, but its prosperity dates from the operations in quartz mining in 1875. It was incorporated first in 1879 by an Act of the Territorial Legislature and in 1888 was reincorporated. In 1881, upon the creation of the county, Butte was chosen the county seat. Pop., 1880, 3363; 1910, 39,165; 1914 (local est.), 40,000; 1920, 41,611. Including the suburbs of Centerville, Walkerville, Meaderville, East Butte, Silver Bow Park, South Butte, and Williamsburg, Butte had in 1914 a population estimated at about 75,000. Consult Freeman, *A Brief History of Butte* (Chicago, 1900); Sanders, "Butte, the Heart of the Copper Industry," in *Overland Monthly*, vol. xlviii, pp. 367-384 (San Francisco, 1906); Davenport, *Butte and Montana Beneath the X-ray* (Butte, 1909).

BUTTE COPPER DEPOSITS. See COPPER.

BUTTER (OE. *butere*, Lat. *butyrum*, Gk. [from Scythian, probably] *βούτυρον*, *boutyron*, from *boûs*, *bous*, cow + *ruptós*, *tyros*, cheese). A substance made from the fat of milk or cream by churning and working to separate the water and other constituents. It has been known for at least 2000 years prior to the beginning of the Christian era, being used as food to some slight extent in early days, but mostly as a medicine and as an ointment after bathing and sometimes for burning in lamps in the place of oil. The Greeks probably derived their knowledge of it from the Scythians or Thracians, and the Romans from the Germans. It was churned in a very crude manner in skin bags or pouches and was evidently a very inferior article. It was not solid, but liquid, and is always spoken of as being poured out. The manufacture and use of butter as a staple article of food is comparatively recent, and in southern Europe it is still sparingly used, being replaced in great measure by olive and other oils. In the art of butter making the Danes have long occupied a foremost place, the Danish butter brings at present a higher average price than that made in any other country. Denmark and Russia are the two leading butter-exporting countries. In the United States the production of butter has made rapid growth since the introduction of the

creamery system, and a product of high quality is now made. It now exceeds 1,600,000,000 pounds a year, valued at about \$400,000,000, and nearly all of it is consumed in this country.

In English-speaking countries butter is usually made from the milk of cows, but in other countries it is also made to a considerable extent from the milk of the zebu and domesticated buffalo. In some cases the milk of goats, sheep, and other animals is also used. Many vegetable oils are worked into a food material of the consistency of butter and are known as "vegetable butter." Examples are coconut butter and cacao butter, which are made from the oils of coconut and of cacao bean.

Butter may contain a small quantity of salt, added to make it more palatable and to aid the keeping qualities, or it may be fresh (unsalted), as demanded by the taste of the consumers. Unsalted or slightly salted butter is consumed largely in England and in some parts of Europe, and the European countries in general salt their butter to a less degree than is customary in America. The natural color of butter is a golden yellow, varying in intensity with the feed, the animal, and the stage of lactation. To make the color more uniform throughout the year, a little coloring matter is commonly added in the making, usually some artificial butter color (q.v.). The demand of different markets varies considerably in regard to the shade of color desired. Some South American countries prefer a deep orange or red color, and butter prepared for export to those countries is colored in accordance with this taste. The other qualities taken into account in judging butter are the flavor, texture, or grain, and the "finish" or general appearance. The flavor usually counts 40 or 45 points on a scale of 100. The characteristic flavor should be well pronounced, and there should be an absence of rancidity or any extraneous flavors. The texture is the appearance when the mass of butter is broken in two or when a knife or trier is passed through it. Under this term is also implied the hardness or firmness.

The composition of butter varies considerably with the process and the conditions of manufacture. The average figures obtained from 695 samples of butter analyzed by the Dairy Division of the Department of Agriculture was as follows: fat, 82.41 per cent; water, 13.9 per cent; salt, 2.51 per cent; curd, 1.18 per cent. This butter was made at many different creameries and under normal conditions. That made in July, August, and September contained on an average somewhat more water than that made at other seasons of the year. By far the most variable constituent is water, and its proportion very largely determines the percentage of fat in butter. The water content is quite largely within the control of the maker. It may run as high as 25 per cent or more, but in such cases it has either been intentionally incorporated or left there through carelessness and is in the nature of an adulteration. There seems no good reason why, with proper making, butter should contain over 15 per cent of water or less than 80 per cent of fat. The standard for butter fixed by the United States government is not more than 16 per cent water and at least 82.5 per cent butter fat.

Cottonseed oil and other oils and fats have been used as adulterants of butter. Formerly oleomargarine was mixed with butter and

sold for pure butter, but at the present time oleomargarine (q.v.) is used largely as a butter substitute, and a cheap grade of butter is used as an ingredient. A variety of preservatives have been used in butter, especially in inferior butter or in that intended for long shipment. The most usual are mixtures of borax and boric acid. Such preservatives are usually regarded as adulterants.

"Whey butter" is that made by churning the fat separated from the whey produced in cheese making. It is usually oily and of inferior quality.

"Renovated" or "process" butter is butter of inferior quality which has been treated by mechanical and chemical processes to remove the disagreeable taste and odors and to eliminate its rancidity. It is then incorporated with a quantity of milk or cream to give the mass a semblance of grain and flavor. A great deal of butter which is of inferior quality or has become rancid after a long period of storage is worked over in this way, and much of it sold as good creamery butter. It first appeared on the market in the early nineties, being known by the name of "sterilized" or "boiled," and was of very poor quality. Its manufacture and labeling are now regulated by United States laws and are under stringent inspection. As a result of this inspection there has been great improvement in the cleanliness of handling and the quality of the product.

Food Value. Butter is used as an article of diet, as a fat for frying, and as one of the ingredients of a large number of foods. Like other edible fats, it is a source of energy in the diet. Of the 0.17 to 0.33 pound of fat required per man per day, according to the amount of work performed, a considerable part may be furnished by butter, since experience has demonstrated that no fat is more wholesome. In 185 American dietary studies it was found that butter furnished, on the average, 1.9 per cent of the total food and 19.7 per cent of the total fat of the daily food.

Butter is very thoroughly assimilated, the coefficient of digestibility of butter fat being 98 per cent or over.

Fresh and salt butter are equally wholesome. Clarified butter is used for a number of culinary purposes. It is prepared by heating the butter until all frothing and deposition of casein has ceased and the liquid has become clear and free from water. The butter made in India from sour milk and called *ghee* (q.v.) is often clarified.

BUTTER, ARTIFICIAL. See OLEOMARGARINE.

BUTTER, ROCK. See ROCK BUTTER.

BUTTER AND EGGS. See TOADFLAX.

BUTTERBUR. See TUSSILAGO.

BUTTER COLOR. An artificial preparation used for coloring butter and imitation products, to give them the desired golden-yellow hue. Butter is colored to give the product a more uniform appearance throughout the season, and when butter from a number of factories or dairies is "blended" it is necessary to color it to prevent its being streaked. There are a variety of butter colors on the market. Annatto was formerly the active principle of most of them, but of late it has been replaced to some extent by coal-tar colors, such as aniline yellow and butter yellow. Other coloring matters occasionally employed are turmeric, saffron, marigold leaves, carrot juice, and chrome yellow. The coloring matter is usually dissolved in some oil. The

preparations are usually of such strength as to require the addition of only small quantities to the cream to produce butter of the desired color. Experiments have indicated that in the small proportions in which they are present in butter they are generally entirely harmless.

BUTTERCUP. See RANUNCULUS.

BUTTERFIELD, DANIEL (1831-1901). An American soldier. He was born in Utica, N. Y., graduated at Union College in 1849, and subsequently engaged in the transportation and express business. In April, 1861, he entered the Federal army as colonel of the Twelfth New York Militia and soon afterward commanded a brigade in Patterson's campaign in Virginia. He was raised to the rank of brigadier general of volunteers in September, 1861, and commanded a brigade in the Fifth Corps of the Army of the Potomac during the Peninsular campaign. He took part in nearly all the engagements, was wounded at Gaines's Mill, and in the second battle of Bull Run commanded a division under Pope. In November, 1862, he was appointed major general of volunteers. He commanded the Fifth Army Corps at Fredericksburg, and at Chancellorsville and Gettysburg was chief of staff under Hooker and Meade respectively. In 1863 he joined the Army of the Cumberland and, as chief of staff to Hooker, participated in the battle of Chattanooga. He commanded a division of the Twentieth Corps in Sherman's Georgia campaign, and at the close of the war was brevetted brigadier general and major general in the United States army. He was in command at New York City from 1866 to 1869, when he resigned; and in 1869 and 1870 was United States subtreasurer there. In 1889 he organized and commanded the Washington centennial parade in New York City, in which over 100,000 men participated. He wrote *Camp and Outpost Duty* (1862). Consult Mrs. J. Butterfield, *Biographical Memorial* (New York, 1904).

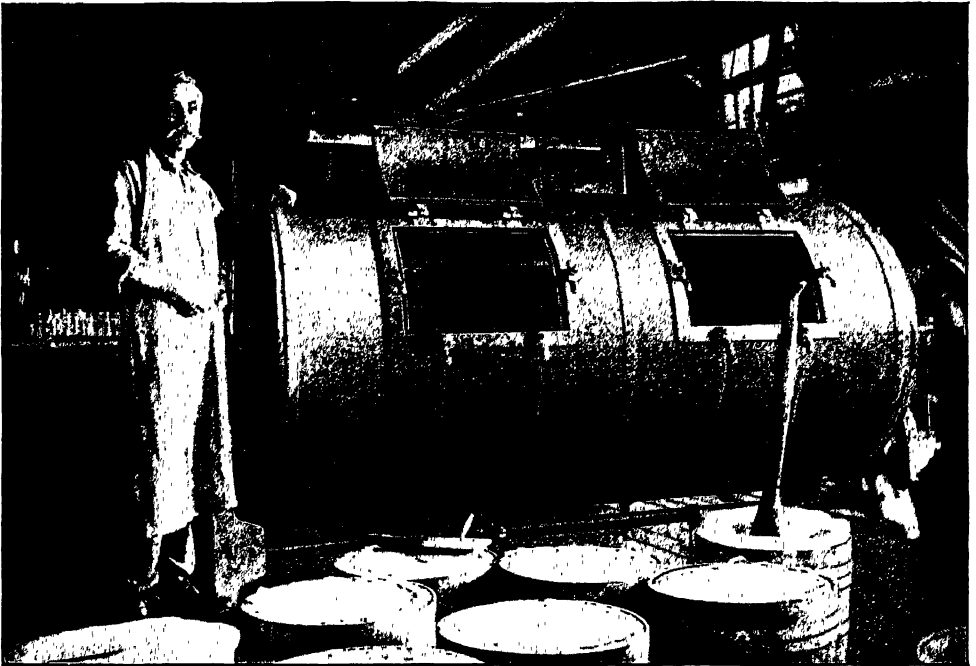
BUTTERFIELD, KENYON LEECH (1868-). An American college president, born at Lapeer, Mich. He was educated at the Michigan Agricultural College and the University of Michigan, served for one year as assistant secretary of the Michigan Agricultural College, became editor of the *Michigan Grange Visitor* in 1892 and of the Grange department of the *Michigan Farmer* in 1896 and in addition to other duties was superintendent of the Michigan Farmers' Institute (1895-99), college field agent of the Michigan Agricultural College (1896-99), and instructor in rural sociology in the University of Michigan (1902-03). In 1903 he became president of the Rhode Island College of Agriculture and Mechanical Arts, and in 1906 president of the Massachusetts Agricultural College. He is author of *Chapters in Rural Progress* (1908); *The Country Church and the Rural Problem* (1911).

BUTTERFISH (for origin of name see below). Any of several fishes. The best known is a blenny (*Murcnoides gunnellus*), about 12 inches long, olive brown in color, with obscure bars and spots, called also "gunnell" and "rock eel." It is abundant in the North Atlantic. (See GUNNELL.) In New York and Massachusetts the name applies to one of the harvest fishes of the Stromateidae, allied to the mackerels. It is oval, about 10 inches long, bluish above and silvery below, and known to science as *Rhombus triacanthus*. It owes its name to the butter-like feeling of its surface, and it is highly

BUTTER-MAKING



THE OLD WAY.



THE NEW WAY.

A COMBINED CHURN AND BUTTER WORKER.

esteemed as food. Lafayette, harvest fish (referring to the time of its appearance), and dollar fish (due to its roundish form and silvery hue) are other local names. Similar species belong to the northwest coast. A third "butterfish" is a small yellow or reddish serranid (*Epinephelus punctatus*) of Florida and the West Indies—one of the groupers (q.v.); and a fourth is a popular longfin (*Chilodactylus nigricans*). See LONGFIN; HARVEST FISH.

BUTTERFLIES AND MOTHS (the name is probably due to the popular belief that it steals butter and milk; or it may refer to the color of the excrement; cf. M. Dutch *boterschijfte, schete*). Insects of the order Lepidoptera which are not separable by any distinct line of structural characters. (See LEPIDOPTERA.) They agree in essentials, and their popular separation is a practical rather than a natural one. Perhaps the nearest we may come to a definite distinction is to call *butterflies* all those Lepidoptera whose pairs of wings are never fastened together in flight, and call *moths* all those whose wings are so united.

"The popular division of Lepidoptera into 'butterflies' (Rhopalocera) and 'moths' (Heterocera) is quite unscientific, the butterflies being more nearly related to the higher moths than these to the lower moths. It has been proposed to separate the three lowest families which have . . . a jugum on each fore wing, as Jugatae, from all other Lepidoptera—Frenatae; also to divide the families with incomplete pupæ (Incompleteæ) from those with obtect pupæ (Obtectæ); also to separate the lowest family on account of the structure of the first maxillæ as a suborder (Laciniata) distinct from all other families (Haustellata). On the whole, it is better not to adopt any division of the Lepidoptera between the order and the family." (G. H. Carpenter, *Insects*, New York, 1899.)

Butterflies as a rule go abroad in the daytime, seeking no concealment, and are brightly colored, while moths more usually fly in the twilight or at night and are subdued in hue. Butterflies are distinguished by the terminal knob (or occasionally hook) of the antennæ, whence the common group name Rhopalocera, while the antennæ of moths (Heterocera) are usually otherwise in form, often filiform or feathery. Butterflies have the habit of holding the wings in a vertical position over the back when at rest, while moths usually keep them flat.

Of the Lepidoptera represented in North America, the following families may be called *butterflies*: Hesperiidæ, Lyceidæ, Lemoniidæ, Nymphalidæ, and Papilionidæ; and all the rest *moths*, among which the Pterophoridæ, Tineidæ, Tortricidæ, Pyralidæ, Geometridæ, Noctuidæ, Bombycidæ, Zygaenidæ, Aegeriidæ, and Sphingidæ are most important. Other families of both sorts belong only to South America or the Old World.

Structure. The head in this group is distinct from the thorax, clothed with hairs, and bears large, compound eyes, and moths have also simple eyes (*ocelli*). The antennæ are always present, and important not only as feelers, but as organs of hearing and smell (see INSECT), the latter service being probably a very important one in this group. These antennæ take various shapes. Among butterflies they are thickened at the end, sometimes into a rounded club, but more often into a spindle shape terminating in a bent point. Of the moths

"some have threadlike antennæ tapering to a fine point; others have feather-shaped antennæ; others still have antennæ which are prismatic in form, and provided with a little hook or spur, at the end; and there are many modifications and variations of these forms." The shape, or at least the size, usually varies between the sexes, being larger in the male than in the female—a fact connected with his duty to search for her, and especially observable in moths. The same may be said of the eyes, which in the nocturnal species cover the whole side of the head and have an enormous number of facets—27,000, it is said, in some hawk moths.

The mouth in the Lepidoptera is modified into a sucking organ, enabling this insect to feed on the nectar of flowers and the sap of trees and plants. The mandibles are rudimentary or absent, and the maxillæ, by a very extraordinary development and modification, are formed into a sucking tube, called the proboscis, which, when not in use, is coiled up between two forward-projecting organs, the labial palpi. It is "composed of three distinct hollow tubes, soldered to each other along their inner margins," and "has much the appearance of a double-barreled gun with a third tube lying below." Nutrition is imbibed through the lower or central tube by a regular pumping, produced by the alternate muscular pinching and loosening of a bulblike arrangement in the head; and the other tubes admit air. In some of the sphinx moths the proboscis may be 10 inches long, and in others its tip is armed with spines which serve to break or cut the surface of fruits, the juice of which is sucked up.

Wings.—The thorax bears the legs and wings. The former are weak and are merely used as organs of support when the insect is at rest, and the front pair of legs may be short or rudimentary, as is the case in Vanessa. The four membranous wings are usually large in comparison with the size of the body; expanse of wing and strength of flight, however, are not exactly correlated, for some of the hawk moths with proportionately small wings are the most enduring flyers, yet the large-winged forms probably fly with less exertion. In actual size lepidopterans vary from almost microscopic species, hiding in the moss, to tropical monarchs 12 inches in expanse. These transparent membranes are supported by a framework radiating from the thoracic joints, which consist of double horny tubes (veins or "nerves" and nervules) one within the other, the inner being filled with air and the outer with nutritive fluids. "These 'nerves,' as custom will persist in terming them, in the butterflies take a bowl-like or ellipsoidal sweep from the base of the wing, forming what is the 'discoidal cell,' whence there branch off to the edges a series of horizontal, almost parallel, slightly divergent nervules. On the position of these the identification of species is most securely based. . . . In the moths, on the other hand, the discoidal cell is less conspicuous." The names of the parts of the wing, and of its veins and nervules, used by entomologists in their descriptions of species, are given in the accompanying illustrations. Further to increase the power of the pinions, the pair on each side are made to act as one. This adjustment is effected either by an overlapping of the hind wing by the front wing (butterflies or some of the larger moths) or the posterior wing possesses a "frenulum," composed of one or more bristles, which fits into a "retinac-

ulum," a membranous flap or a bunch of scales on the anterior wing (other moths). According to Hampson, "the form of the frenulum is of use in determining sex, as in the males of all the forms that possess it it consists of hairs firmly soldered together so as to form a single bristle, while in nearly all females it consists of three or more bristles, separate and shorter than that of the male."

Scales.—The wings of all Lepidoptera, as the word implies, are clothed more or less completely with scales, which are modified hairs—hairs that are very short and much widened; and every gradation may be found, in a genus like *Ithomyia*, between the hairs on the body and wings and the scales. They are like small chitinous bags with the sides pressed together, and each one has on its proximal end a short stalk which fits into a cavity of the wing membrane. They are of various shapes, notched on the posterior margin, striated, etc., and "the males of many species have peculiarly shaped scales arranged in tufts and folds, which are called 'androconia' and are useful in microscopically determining species." The scales are in rows, and overlap much as do the scales on a fish or the shingles on the roof of a house. They rub off easily, and entomologists know how to remove them without serious injury; but when taken from a living insect they diminish or destroy its ability to fly. They number hundreds of thousands, and their use is to strengthen the membranous wings, and when they overlap the wing membranes at the edges to a considerable extent, as occurs in some cases, they also increase the wing area. Another use is to bear the colors of the wings, for when the scales are removed the color is gone. This color is due either to pigment contained within the scale or its walls, or to the fine striations on the upper surface which give rise to metallic "interference colors." Both albinism and melanism occur. The pigments are perhaps in the nature of biliary excretions, such as urates from nitrogenous matter and melanins from carbonaceous matter.

Distinctions of Sex.—The abdomen is composed of segments, 9 for the female and 10 for the male, and contains the viscera, and the lateral spiracles by which air is admitted to the respiratory system. It is shorter in most butterflies than the hinder wings, and in most moths is tufted along the dorsal line and on the end. The terminal segment has various appendages and contains the sexual organs of both sexes. There is often a very striking difference in size, color, and form between the females, especially among the butterflies, where procreation may be the sole duty of the imago during its brief summer existence. In case there are several broods of butterflies in a season, each brood may have its characteristic coloration. Our Ajax butterfly is three-brooded, and before the facts of its life history were known, each brood had been given a specific name. By artificially varying the temperature or moisture, any or all the seasonal forms may be produced at will from one and the same laying of eggs. The males, which are usually more gayly decorated than the females and exceed them in number, are continually in search, about the food plants, of mates, who exert a far-reaching attracting power. Collectors utilize this instinct; having caught a female they expose it in a cage and soon are likely to find several males flocking about it. Under

certain circumstances eggs may be laid by an unfertilized female (for which see REPRODUCTION and PARTHENOGENESIS). Adherents of the doctrine of sexual selection believe the female exercises a choice among these assembled suitors, selecting for her partner the best, according to the standard of the species, and so maintaining the high quality of the race. A single impregnation is sufficient, and the impregnated females soon begin to lay eggs, having accomplished which, they die, in the great majority of cases, the exceptions being those which are double-brooded, or (a very few) where the adults largely survive for winter.

Hibernation and Migration. A few butterflies, such as the mourning cloak, are able to endure in a state of torpidity the winters of the north. A large number winter over as pupæ, and others, like the brown and black Isabella caterpillar, as well-grown caterpillars. Others hatch out only in time to go into winter quarters. Many winter over as eggs, and not a few in two different stages, the latter having a double chance of surviving. It has been established by at least one set of careful observations that the cabbage butterfly (see CABBAGE INSECTS) of southern Europe migrates or flies in a general southerly direction in the fall and northerly in the spring. In the United States the milkweed butterfly (q.v.) sometimes so migrates in enormous swarms. Such migrations are even more common in the tropics. In his work on Ceylon, Sir James Tennent writes of "the extraordinary sight of flights of these delicate creatures, generally of white or pale-yellow hue, apparently miles in breadth, and of such prodigious extension as to occupy hours and even days uninterruptedly in their passage." These migrations are at times occasioned by lack of food plants on which to deposit eggs. In other cases we know they are seasonal. By going south the butterflies find a climate in which they are able to winter.

Reproduction and Metamorphosis. The eggs of all Lepidoptera are laid on or near the food plant, i.e., the plant upon which the young must feed. In number they vary from less than 100 to several thousand and are deposited continuously and rapidly, as a rule. They may be placed singly, as is common among butterflies, or, as is more usual among moths, in clusters or masses, adhering to their support and perhaps to each other by a glutinous coating; while some moths prepare a sort of nest of hairs plucked from their bodies, upon and within which the eggs rest, or otherwise protect them from observation or the weather, especially those destined to last through a northern winter or tropical season of drouth. Their membranous shells take various forms and are often exceedingly beautiful when seen through the microscope. "Some," says Holland, "are spherical, others hemispherical, conical, and cylindrical. Some are barrel-shaped, others have the shape of a cheese, and still others have the form of a turban. Many of them are angled, some depressed at the ends. Their surface is variously ornamented. Sometimes they are ribbed . . . [and] between these ribs there is frequently found a fine network of raised lines variously arranged. . . . As there is great variety in the form of the eggs, so also is there great variety in their color. Brown, blue, green, red, and yellow eggs occur. Greenish or greenish white are common tints. The eggs are often

ornamented with dots and lines of darker color. . . . Fertile eggs, a few days after they have been deposited, frequently undergo a change of color, and it is often possible with a magnifying glass to see through the thin shell the form of the embryo which is being developed within the egg." The eggs may hatch in a few days or only after months, for numerous species pass the winter or the dry season in the egg. The larva which is born in the egg, and escapes by an opening of curious structure, which is made at the upper end of the shell, is known as a caterpillar.

This larva, or "caterpillar," is a wormlike creature and takes a form, color, etc., characteristic of its group and species. The term properly is restricted to lepidopterous larvæ alone, though sometimes applied to other larvæ, as those of the sawflies. The head of the caterpillar is conspicuous, often large, and composed of horny (chitinous) material, taking various shapes. It is provided with six simple eyes (*ocelli*), usually to be seen only with the aid of a lens, which are either just above each mandible or on each side of the head; there are two rudimentary antennæ. The mouth is adapted for tearing, cutting, and masticating the substances on which the caterpillar is destined to feed, which are very various in the different species, although in all extremely different from the food of the perfect insect; it is provided with strong upper and lower jaws, a labium, or lower lip, and four palpi. In the mouth (labium) also is situated the spinneret of those species which, when they change into the chrysalis, envelop themselves in silken cocoons. (See *SILK*.) The first three segments of the body are each furnished with a pair of short legs, which are hard, scaly, and clawed, and represent the six legs of the perfect insect; some of the remaining segments are also furnished with short feet (*prolegs*), varying in all from 4 to 10 in number, the last pair situated at the posterior extremity of the body; but these are membranous or fleshy, and armed at their extremity with minute hooks. Those caterpillars in which the prolegs (which are shed in the last molt) are pretty equally distributed along the body, move by a sort of regular crawling motion; but those which have only four such feet, near the posterior extremity, move by stretching the body out to its full length, taking hold by their fore feet, and then bending the body into an arch, thus bringing the hind feet forward, when the body is stretched out again for a new step, and so on; this last is the method of progression of the geometrid moths, called loopers, inch-worms, or measurers. The larva appears to guide itself by its feelers (palpi). The heads of many caterpillars also have defensive spines, or arrangements for emitting noisome liquids or odors, to be referred to later.

The body of the caterpillar contains nearly all the organs of the adult butterfly or moth. Respiration goes on through nine spiracles on each side, two on each ring, except the second, third, and last. There are no external traces of sexual organs, but there arise, during this stage, the "imaginal disks," which develop into the wings and legs of the adult insect. These rudiments of wings exist even in very young caterpillars as a thickening and bagging in of the hypodermis. Into this bag trachea and blood make their way. Just how these internal wings reach the outside is not known; probably by the

destruction of the outside hypodermis. If the wing membrane breaks during development, so that the blood or hæmolymp exudes, the injured wing will be smaller or deformed. Sometimes the wings fail to expand properly because they dry too soon, and a wet sponge under a bell jar, with transforming Lepidoptera, will aid in the production of perfect specimens.

Feeding Habits and Mischief.—Caterpillars find themselves at birth in contact with proper food and begin at once to devour it and to obey certain other instincts necessary to their life and prosperity. This is the stage in which the butterfly or moth gets most of its nourishment and growth, none taking food in the next or pupal stage, and many not feeding at all, as imagos. The great majority are vegetable eaters, many being limited to a particular kind of plant or to a few nearly allied plants. Some feed on flowers, some on seeds, some on roots, and some even on the woody portions of stems; some on wool, hides, furs, and other animal substances; a few on lard and other kinds of fat. Some feed in the dark and some in the light. Some kinds seem to eat almost incessantly, but most of them have alternate periods of ravenousness and quiescence. As many of the favorite food plants have been cultivated by civilized man, and other substances eaten by these creatures have been made use of by him, he has multiplied by his operations the supply and consequently the numbers of certain species until they have become pests, destructive of his work and profits. It is in the caterpillar stage that almost all the destructiveness of the Lepidoptera is accomplished. On certain years they succeed in denuding whole forests or many fields. The cut-worm, the army worm, and the cotton worm are well-known pests. Their voracity is remarkable. According to Trouvelot, when a *Polyphemus* caterpillar hatches, it weighs one-twentieth of a grain, and when it is 50 days old it weighs 207 grains and has consumed 120 oak leaves, weighing three-fourths of a pound. "So the food taken by a single silkworm in 56 days equals in weight 86,000 times the primitive weight of the worm. What a destruction of leaves this single species of insects could make if only a one-hundredth part of the eggs laid came to maturity! A few years would be sufficient for the propagation of a number large enough to devour all the leaves of our forests."

Taken as a whole, caterpillars are economically so injurious that were it not for the great depletion of their numbers by their multitudinous foes, they would soon destroy the vegetable kingdom. They injure, or even kill, shrubs and trees as well as all sorts of garden vegetables. They eat woolen stuffs of all kinds and furs. To offset all their destructiveness, they offer little save silk that is, at present at least, known to be useful to man. There are a few species that are helpful to vegetation, such as the *Lycænidæ*, which feed on plant lice and scale insects. One such species (*Fenisea tarquinus*) occurs in the United States. A few forms are aquatic and feed on plants under water.

Self-Protection in Caterpillars.—The skin of some caterpillars is naked; that of others is covered with hairs, spines, or tubercles. Most are solitary, but some make for themselves nests or tents of silk, under which they dwell in societies, protected from the inclemency of the weather. Many construct cases or sheaths by agglutinating various substances together, as

the caterpillar of the common clothes moth. Some roll together leaves and fix them by threads, so forming a dwelling for themselves; and a few burrow and excavate galleries in the substance of leaves or in the pith of plants. Most of them are in color brown or green, while those hidden in galleries are whitish; but many carry gaudy colors and numerous ornamental or strange protuberances. All these characteristics are connected with Nature's effort to protect them from their enemies. Alfred Russel Wallace has made clear the fatality to caterpillars of even slight wounds, for "a slight wound entails great loss of blood, while a modest injury must prove fatal." Therefore devices that enable caterpillars to escape the notice or the attacks of enemies are very useful to them. Many caterpillars possess a disagreeable smell or a nauseous taste, or both. Thus, those of the swallow-tailed butterflies "are provided with a bifurcate or forked organ, generally yellow in color, which is protruded from an opening in the skin back of the head and which emits a powerful odor; this protrusive organ evidently exists only for the purposes of defense." Most caterpillars resist an attack by hurling their bodies violently from side to side. Others assume startling attitudes or have a surprising arrangement of color. These terrifying attitudes may accompany disagreeable tastes and so serve more vividly to impress upon the foe the unpleasant quality of the prey. Nevertheless, as Professor Poulton has stated, hungry animals may come to eat and like distasteful caterpillars. Certain caterpillars escape the enemy by resembling the color of the background, concerning which more is to be said elsewhere. Others, such as the goemetrids or measuring worms, may combine with this protective coloration the capacity of attaching themselves by the hind end and stretching out in the air like a twig. This rigid attitude they may maintain for some time. Imitation may even be carried to the length of mimicking other kinds of animals. Thus the huge eyespots, peculiar folds, and marks on the anterior end give some forms the appearance of snakes or other strong animals. The color of caterpillars is due to two sources: (1) pigment gained from the food; (2) pigment inherent in the deep-lying tissues or skin. Most green caterpillars seem in some way to be colored by the chlorophyll of the food plant. Yellow is derived mainly from xanthophyll of plants. Pigment derived from food plants tends gradually to give the caterpillar the coloration of the surroundings. See PROTECTIVE COLORATION; MIMICRY; ETC.

Struggle for Existence.—Only a few out of the vast hosts of caterpillars ever reach maturity. Many are destroyed by cold, wet, drouth, or lack of food. Vast numbers fall prey to birds, reptiles, and mammals. Many others are caught by wasps and stored up as food for the young, or are captured by adult and larval predaceous beetles. Ichneumon flies deposit their eggs within great numbers of caterpillars, where they develop and eventually kill the caterpillar or pupa. Tachina flies also lay their eggs on caterpillars, and the larvæ are parasitic within them. In addition, caterpillars are subject to fungus and various other contagious diseases which are particularly fatal to the cultivated silkworm.

Molting.—Soon after the caterpillar begins to take food and increase in size, it is obliged to

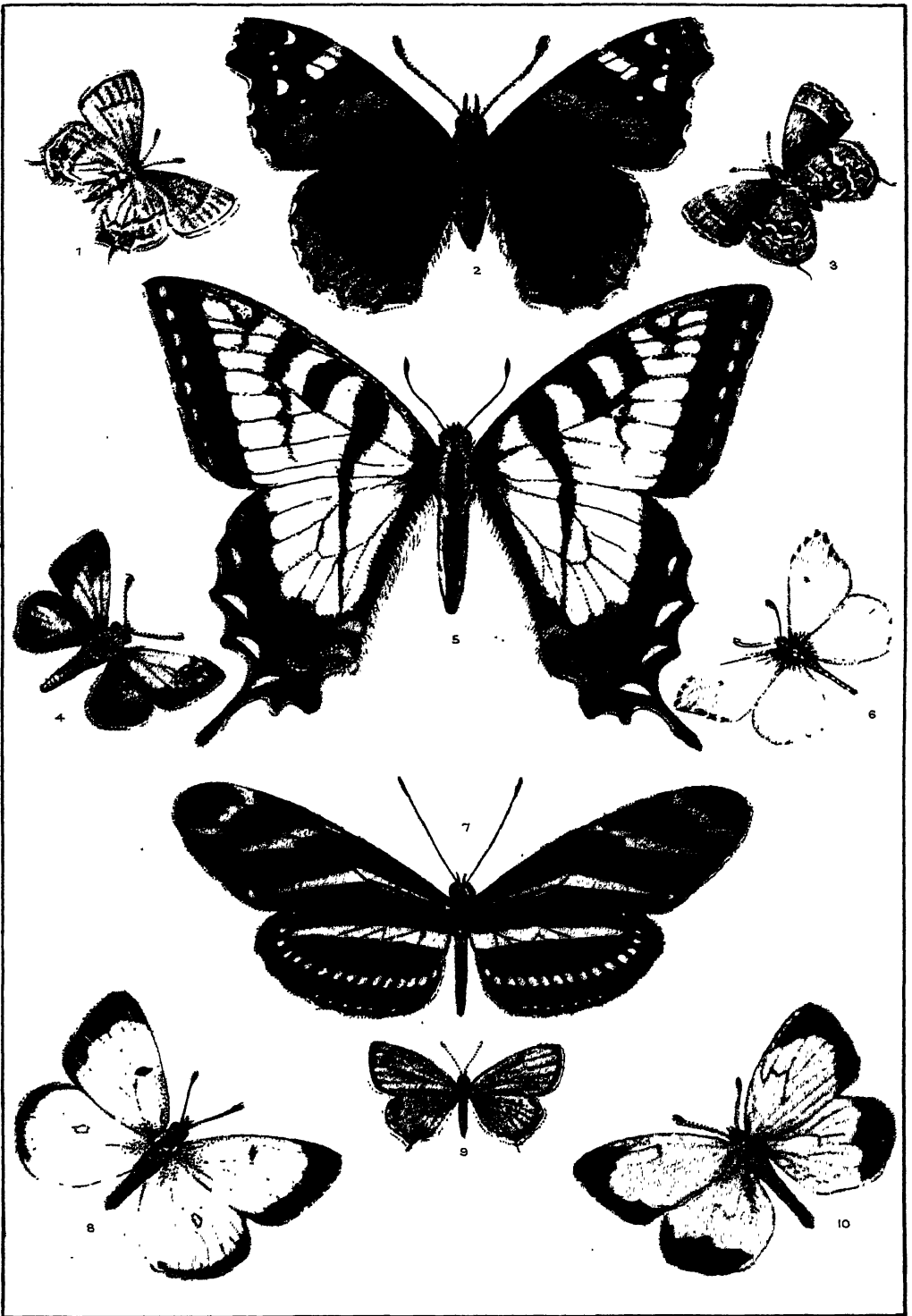
shed its skin, which has become too tight. To take its place, a larger, soft one is developed beneath the old one. This new skin becomes, in its turn, too tight and unelastic and must be shed. A number of such moltings or ecdyses take place before the embryo attains full size. These normally occur at regular intervals, and four or five molts complete the growth; but "in cases where caterpillars hibernates . . . a long interval necessarily elapses. Some Arctic species are known in which the development from the egg to the perfect insect covers a period of two or three years." The manner in which the molting is effected is very interesting. When the necessity is felt, the caterpillar ceases feeding, attaches itself firmly to some object, and becomes quiet for a time. "The process begins with a splitting of the skin on the upper surface of the thorax; this is continued forward to the head, which opens along the sutures. The head and thorax of the new stage, or 'instar,' are then worked out by an energetic wriggling motion of the insect, and the old skin is gradually stripped off from before backward, like the finger of a glove. In caterpillars it is known that a fluid, secreted by glands in the hypodermis, is present at molting times between the new and the old skin, which it helps to separate." (Carpenter.)

The caterpillar may be regarded as a recapitulation of one stage in the phylogenetic development, i.e., in the evolution of the lepidopterous insect. It may indeed be said to reproduce a stage in the phylogeny of insects best represented to-day by *Peripatus*, a primitive and widely distributed genus that serves to connect arthropods with worms.

Pupation.—After a caterpillar has passed through the period of successive feedings and moltings which the economy of its species requires, it prepares to pass into the second larval stage and become a *pupa*, in which tough integuments cover the developing organs instead of soft skin. Pupæ may cover themselves with a case of silk or other materials, called a cocoon, or may remain naked, in which case they are known as chrysalids (sing. *chrysalis*). The former is the custom among the moths, the latter among the butterflies. The insect in this stage is utterly helpless, and a cocoon serves as a protection. It is spun as the last act just before passing into the pupal stage and is formed of silken threads, produced by the hardening of the fluid secreted by the spinning glands. These may be wound round and round the larva until the silken case thus made suffices; or they may form merely the lining of an earthen cell (for many species pupate under ground), or they may serve to bind into the cocoon their own hairs, chips of wood, or other materials, or to tie down rolled leaves, or form a weblike network hung like a bag or a hammock from some support, or making a fuzzy mass in some crevice or among leaves and twigs. When the work of spinning the silk is once begun, it is carried on almost without cessation for several days. The forms of cocoons are various; when not concealed, they are usually of a tint that blends well with their surroundings, leaving them inconspicuous, while their material is calculated to resist the attacks of insect-eating birds and mammals, or of ichneumonflies and other intending parasites.

Cocoons are mainly the work of moths, to which the term "pupa" has been sometimes re-

AMERICAN BUTTERFLIES



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- 1 GRAY HAIR-STREAK - THECLA MELINUS (UNDER SURFACE)
- 2 RED ADMIRAL - PYRAEIS (VANESSA) ATALANTA
- 3 OLIVE HAIR-STREAK - THECLA DAMON (UNDER SURFACE)
- 4 HOBOMOK SKIPPER - ATRYTONE (PAMPHILA) ZABULON
- 5 TIGER SWALLOW-TAIL - PAPILIO TURNUS

- 6 FALCOTE ORANGE-TIP - ANTHOCHARIS (EUCHLOE) GENUTIA
- 7 THE ZEBRA - HELICONIUS CHARITONIUS
- 8 YELLOW CLOVER BUTTERFLY - COLIAS PHILODICE
- 9 EASTERN TAILED BLUE - LYCAENA COMYNTAS
- 10 NICIPPE BUTTERFLY - TERIAS NICIPPE

ALL NATURAL SIZE

stricted, for the butterflies pass their pupal stage incased in comparatively rigid integuments, which form a "chrysalis." They vary greatly in form, some being acorn-like, others very angular, etc., and most are obscure in tint, so as to be easily overlooked, but some are brilliant in color, usually of golden or metallic hues, whence the name *chrysalis*. Some butterfly chrysalids (Nymphalidæ) are simply suspended from the posterior end (Suspensi); those of others (Papilionidæ) are held in place by an additional strand or girdle of silk (Succincti). Within the chrysalis or cocoon is the immature butterfly or moth, and all the parts belonging to the future adult insect may be found by examination. Breathing goes on through air openings, and the parts steadily develop. "The pupæ of the vast majority of moths, of butterflies, and of two-winged flies have the limbs and wings not merely pressed close to the body, but immovably fixed thereto by a general hardening and fusion of the outer skin. Such pupæ are distinguished as 'obtect.' But although the limbs are incapable of motion, certain abdominal segments remain free, so that the hind body can be to some extent bent and turned about; and, by means of rows of spines on the abdominal segments, the pupa is in many cases enabled to work its way out of its shelter, when the time for the final change has arrived." Such are styled "incomplete." The pupal stage may be of long or short duration. Many Lepidoptera pass the winter or the tropical dry season as pupæ. Some have several broods a year, and in such the pupal stage of the hibernating brood will last longer than that of the others.

The Imago.—When the pupa has arrived at maturity, its coverings split and allow the emergence of the "imago" or perfect insect. "Hardly anything in the range of insect life," remarks Dr. W. J. Holland, "is more interesting than the rapid development of the butterfly after its first emergence from the chrysalis. . . . The imago, as it first emerges, is provided with small, flaccid wings, which, together with all the organs of sense, such as the antennæ, require for their complete development the injection into them of the vital fluids, which upon first emergence are largely contained in the cavities of the thorax and abdomen. Hanging pendant on a projecting twig, or clinging to the side of a rock, the insect remains, fanning its wings, while by the strong process of circulation a rapid injection of the blood into the wings and other organs takes place, accompanied by their expansion to normal proportions, in which they gradually attain to more or less rigidity. . . . The body is robbed of its liquid contents in a large degree; the abdomen is shortened up; the chitinous rings which compose its external skeleton become set and hardened; the wings are expanded, and then the moment arrives when, on airy pinions, the creature that has lived a wormlike life for weeks and months, or which has been apparently sleeping the sleep of death in its cerements, soars aloft in the air, the companion of the sunlight and the breezes."

It is impossible here to go into any description of butterflies and moths. Butterflies, as a rule, are more brilliant than moths, many of them, in the tropics, especially resplendent in metallic hues, rivaling those of the "eyes" of peacock plumes. Moths, on the contrary, are more usually dull of hue, and less given to ap-

pearing in open places, even when they fly by day, yet some are high-colored and beautiful.

Both butterflies and moths, and their caterpillars, may resemble to some extent the shape of the object or the coloration of their background, or of other insects. Thus they illustrate most strikingly and copiously various phases of "mimicry" and "protective coloring."

Butterflies, like bees and many other insects, carry pollen from flower to flower, and hence aid greatly in the formation of seeds. See POLLINATION.

Geographical Distribution. Lepidoptera occur wherever plant life suited to the nourishment of the caterpillars is present. They are sun-loving forms and are most numerous in species in the tropics. However, in numbers of individuals, some of the temperate zone forms far outrank any of the others. Some species occur in the Arctic zone and on the tops of snow-clad mountains. Certain forms flourish in the far north, in Greenland, Labrador, and Iceland, or on tops of snow-capped mountains. Some species are restricted by temperature or food plant to a very limited area, while others are practically of world-wide distribution. Widely distributed forms either feed on widely distributed plants or can feed on a number of different food plants.

The delicacy of the Lepidoptera has prevented their common preservation as fossils. The Tertiary rocks of the western United States, and the rocks from the time of the British chalk down, have yielded remains of a few scattered species.

More than 50,000 species of Lepidoptera are known, of which almost 7000 occur in America north of Mexico. Of skippers there are two families—the large skippers, Megathymidæ, and the smaller skippers, Hesperiidæ. The butterflies include the Papilionidæ, Pieridæ, Lycaenidæ, and Nymphalidæ, and all other families (over 40) belong to the moths.

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York, 1912); Longstaff, *Butterfly Hunting in Many Lands* (New York, 1912). For works relating to special families and species, see their names.

PLATE OF BUTTERFLIES AND MOTHS

1. Butterfly's wings, giving names of parts.
2. Wings, giving names of veins and nervules; *I*, *I* internal veins; *C*, costal veins; *SC*, subcostal vein; *SC*, 1, 2, 3, 4, 5, subcostal nervules; *UR*, upper radial; *LR*, lower radial; *M*, median vein; *M*, 1, 2, 3, median nervules; *SM*, submedian veins; *PC*, precostal nervule; *UDC*, *MDC*, *LDC*, upper, middle, and lower discocellulars [after Holland].
3. Resting position of a butterfly.
4. Typical antenna of a butterfly.
5. Resting position of a moth (with typical plumose antennae).
6. Mouth parts of a butterfly, showing the extended double proboscis (maxilla, *mx*), mandibles (*m*), labrum (*l*), labial palpi (*lp*), and base of the antennae (*an*) between the great eyes.
7. Some of the many forms of lepidopteran eggs: *a*, one with a lid lifted at hatching for egress of larva.
- 8, 9. Forms of wing scales.
10. Arrangement of the scales clothing the wing.
11. A caterpillar, showing parts: *A*, cephalic segments (head); *B*, thoracic segments; *C*, abdominal segments; *a*, rudiments of the six true legs; *b*, four pairs of prolegs.
12. Caterpillar of a moth (*Stauropus fagi*), showing use of prolegs in walking, and extreme development of thoracic larval legs.
13. Caterpillar of a Papilio, showing its retractile osmateria protruded from the neck.
14. Caterpillar of a puss moth, showing retractile anal mastigia extended.
15. Caterpillar or measuring worm of a geometrid moth in an erect and stiffened position simulating a dead twig.
16. Parts of a pupa (chrysalis of a sphinx moth): *a*, tongue-case; *b*, eye case; *c*, trunk case; *d*, first abdominal segment; *m*, point terminating abdomen; *s*, spiracles, or breathing pores, opening into trachea.
17. Process of change of a butterfly (*Anosia plerippus*) caterpillar into a pupa (after Riley): *a*, caterpillar just before the rending of the skin; *b*, chrysalis just freed from the molted caterpillar skin, except the cremaster; *c*, pupa holding itself in place, head down, by seizing the folds of the shed skin between the edges of its abdominal segments while it searches with its cremaster for the button of silk, attached to a twig or leaf, in which it will hook the cremaster and hang; *d*, fully developed form of the chrysalis (light green with gold "buttons"). This is an example of a suspended pupa (*Suspensi*).
18. A belted pupa (*Cincti*).
19. History of transformation in the Lepidoptera (a moth): *a*, egg; *b*, young larva; *c*, mature larva (caterpillar); *d*, pupa, within a cocoon; *e*, mature moth (imago).

BUTTERFLY FISH. A fish of a tropical marine family (Chaetodontidae), so called because of its gay colors and fluttering activity about the coral reefs, among whose growths it chiefly makes its home, and where it lives by capturing small animals, darting about with an irregular agility suggestive of a butterfly in a garden. It is small, short, very much compressed and deep, and the scales extend over the dorsal and ventral fins so that it is difficult to say where the fins merge into the body. The flesh is excellent food. See CORAL FISH.

BUTTERFLY TULIP. See CALOCHORTUS.

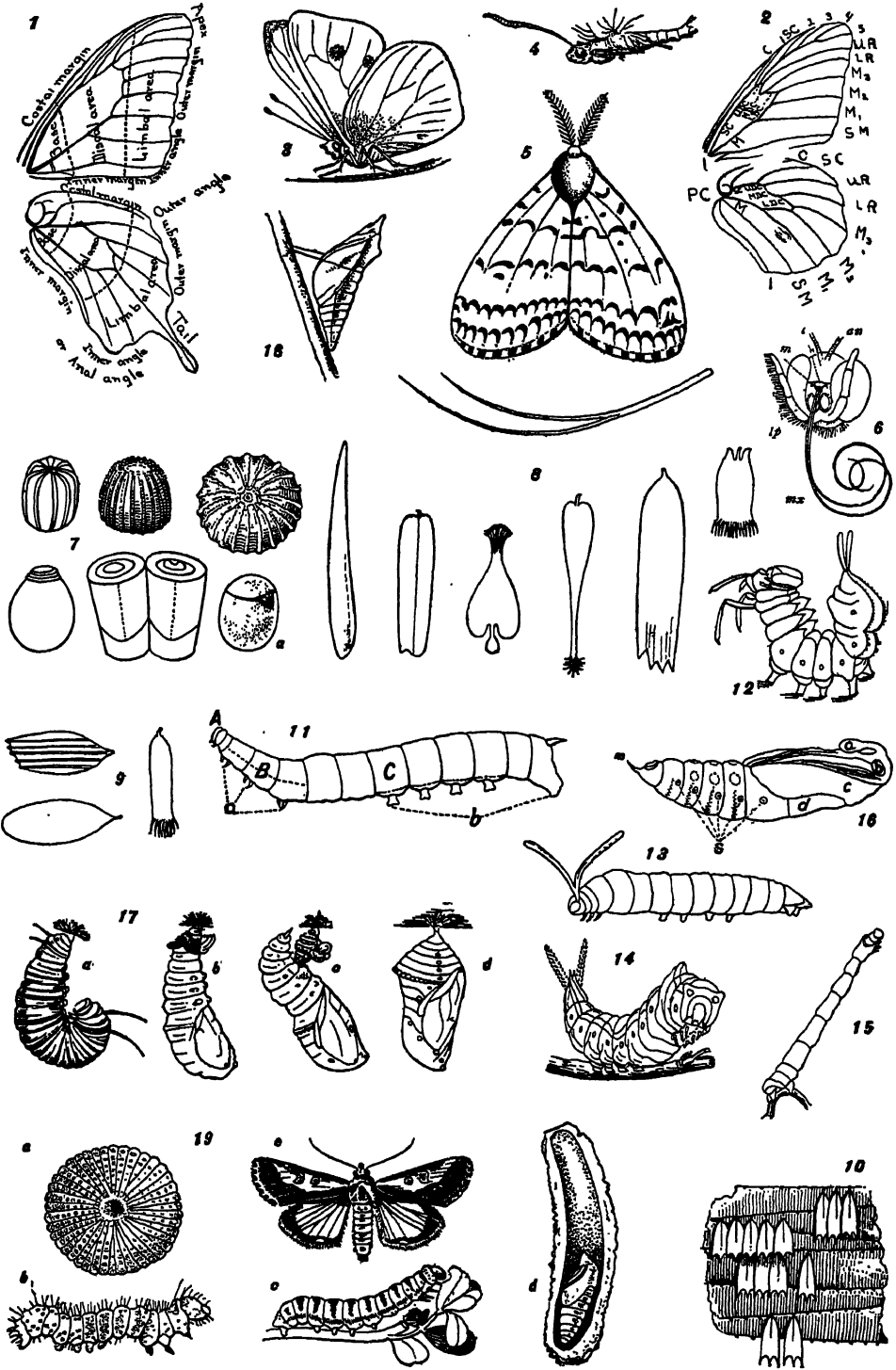
BUTTERFLY WEED (possibly on account of its gaudy orange-red flowers), or PLEURISY-ROOT (*Asclepias tuberosa*). A "milkweed" found in many parts of the United States, which has obtained a considerable reputation for the medical virtues of its root. The root is large, formed of irregular tubers, or spindle-shaped branches, externally yellowish brown, internally white, with a somewhat acrid, nauseous taste when fresh, merely bitter when dried. It yields its properties to boiling water and is usually administered in the form of a decoction, fluid extract, or sometimes as a powder. It is diaphoretic and expectorant and has been found useful in the early stages of pulmonary affections, in rheumatism, and in dysentery. The stem of the plant is erect, 1 to 2 feet high, and

hairy; the flowers a brilliant orange yellow. Unlike most of the milkweeds, it does not secrete latex (the "milky juice" of annuals). See ASCLEPIAS.

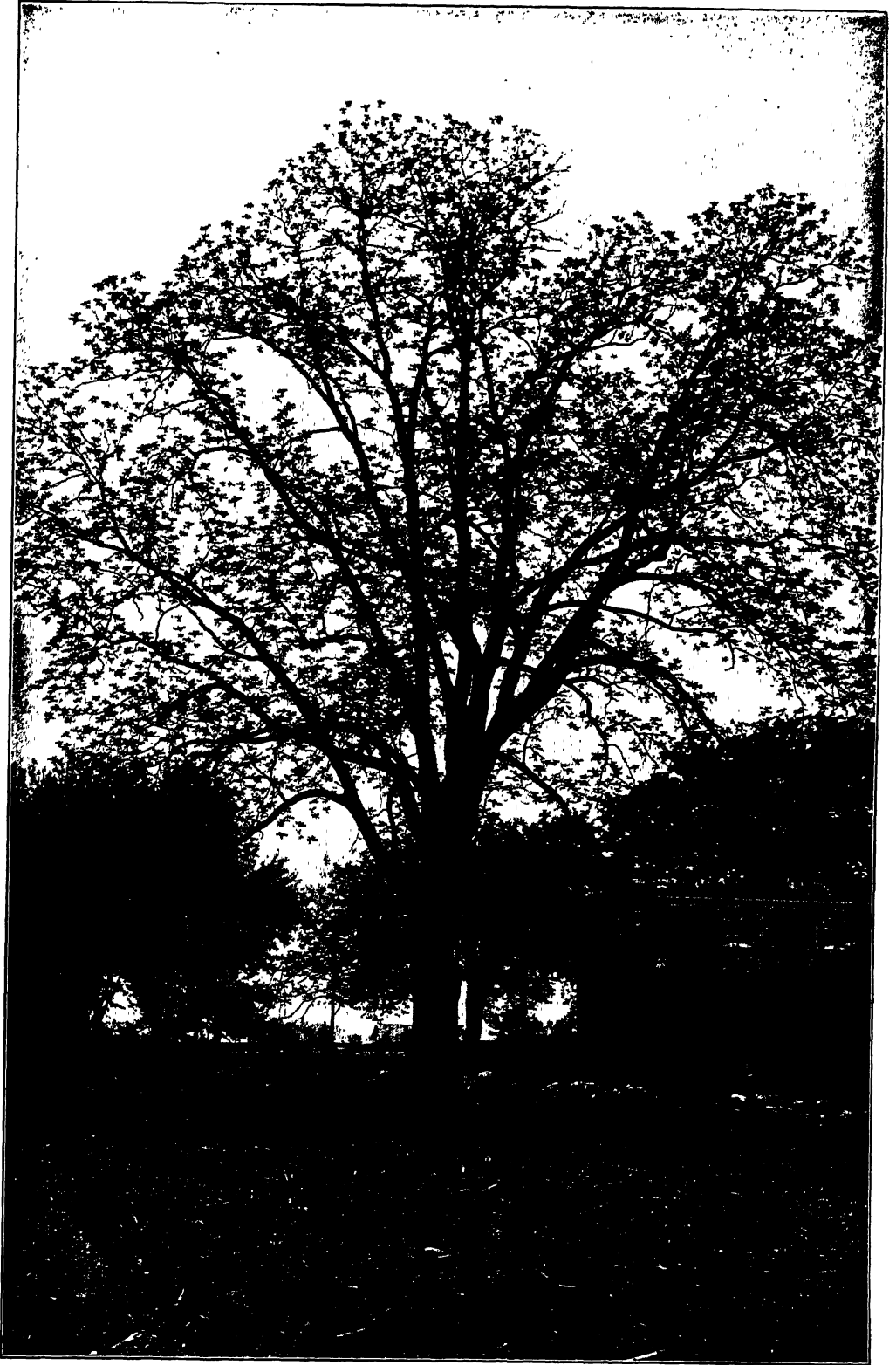
BUTTERINE. A name for a butter substitute, used interchangeably with oleomargarine. See OLEOMARGARINE.

BUTTER MAKING. The process of making butter from cow's milk is divided into the operations of creaming or separating, ripening, churning, and working or finishing. The fat in milk exists in the form of minute globules in suspension. In the operation of creaming, the separation of these globules from the rest of the milk is affected either by setting the milk in shallow pans or in deep cans in cold water, or by means of a cream separator. In both shallow and deep setting the cream is raised by gravity. The fat globules, being lighter than the water and other constituents of the milk, gradually rise to the surface on standing, carrying with them some of the other constituents also. The time required and the completeness of the operation depend largely upon the size of the fat globules, which differs in the case of different breeds of cows, the larger globules rising more readily. The fat left in the skim milk consists mostly of small globules which failed to rise as soon as the others. The fat content of the skim milk is the measure of the efficiency of creaming. In shallow setting in pans the force of gravity alone is relied upon, the milk being set as quickly as possible after it is drawn, and the cream skimmed off after standing 24 hours or longer. The loss of fat by this method is quite large, amounting to about 20 per cent, and the skim milk contains from 0.5 to 1.5 per cent of fat. In deep setting, cans about 18 inches deep are used, and these are immersed or partially submerged in cold water, preferably at about 40° F. The low temperature causes the globules to rise more rapidly and more completely than in shallow setting. The milk is allowed to stand in these cans for 18 to 24 hours, and the cream is then removed from the top by means of a dipper, or the skim milk is drawn off from below, leaving the layer of cream in the can. The latter method is the least wasteful, and by it the fat in the skim milk may be reduced to as low as 0.2 per cent under favorable conditions. The separator has quite generally superseded deep or shallow setting in creameries and in large dairies during the past few years. In this method the cream is separated from the milk by centrifugal force, in a bowl or drum, revolving at a high rate of speed, from 5000 to 8000 revolutions a minute and even more. The milk enters through a tube reaching to the centre and near the bottom of the bowl, where the high rate of speed causes the heavier milk fluid (the serum) to gravitate towards the circumference of the bowl, while the lighter cream remains near the centre and rises to the upper part of the bowl. The skim milk flows out through a side tube, and the cream through a second tube leading from the centre near the top. The operation is continuous, milk flowing into the bowl and skim milk and cream flowing out of it without interruption. The rate of separation varies with the size and capacity of the machine, the smaller hand separators skimming from 200 to 500 pounds an hour, and the larger forms 2000 pounds and over. By means of various appliances within the bowl the sepa-

BUTTERFLIES AND MOTHS



BUTTERNUT TREE



BUTTERNUT (*Juglans cinerea*), Northern New Jersey, early May.

ration of the fat is made quite complete, the skim milk from a good separator properly operated containing only about 0.1 per cent of fat and in some cases only 0.05 per cent.

The cream obtained by setting or by the separator may be churned at once, as is the case in making sweet-cream butter, but it is usually first "ripened" or soured. The object in ripening is to develop the characteristic flavors of butter and a slight acidity which aids in churning and affects the texture of the butter. Ripening is effected by adding to the cream a "starter" of sour skim milk, buttermilk, or cream from a preceding churning, or a commercial preparation of the desired micro-organisms called a lactic ferment or pure culture. Germs which may cause improper souring, or impart an undesirable taste or quality to the butter must be kept from gaining access to the cream, and it is with this view that pure cultures are used for ripening. Pasteurization of the milk or cream used in butter making, which is practiced quite extensively in some countries, has the same object, the theory being to kill all the germs which may be in the milk or cream and add only such as are desirable.

The cream is ripened with the aid of the starter mentioned, by keeping it at a constant temperature (60° to 70° F.) until the proper amount of acid has developed, the time required depending upon the number of germs present and upon the temperature. It is then ready for churning. In this process the cream is agitated in a churn (q.v.) to cause the particles of butter fat to unite into masses so that they can be separated from the buttermilk. This is accomplished at a temperature of from 50° to 65° F., the larger fat globules coagulating and uniting first, and the smaller ones adhering to these as they come in contact with them. Finally, the whole body of fat may be brought together in a practically solid mass and the buttermilk drained off. After washing, the butter is worked by hand or by machine (see BUTTER WORKER) to remove the buttermilk and washings more completely, is salted to suit the taste, and then is either packed in tubs or boxes or made into prints.

Various factors affect the quality of butter aside from the care in making. Among these are the feed of the cows, the conditions under which they are kept, the stage of lactation of the cows, the handling of the milk and cream to avoid absorbing odors or becoming tainted, etc. The perfection of the separator and other dairy machinery has led to material improvement in the quality of American butter, and has made it possible to make good butter in almost all parts of the United States. The creamery system of butter making has been extensively introduced into all parts of the country, and some of these central plants have enormous capacity. In spite of this there is still much more butter made on farms than in creameries, although creamery butter controls all the large markets. With modern methods 100 pounds of fat in the milk should yield about 113-116 pounds of butter. The cost of making at creameries (exclusive of cream or milk) varies from 2 to 4 cents a pound. Butter is transported from place to place by a highly developed refrigerator-car system. When held at constant low temperature, it deteriorates very slowly, and May, June, and July butter is now kept in cold storage, at zero or -5° to -10° for 7 or 8 months. Stor-

age butter is usually kept in wooden tubs, but recent experiments have shown that it can be kept in tins provided the tins are coated with lacquer. Large quantities of tinned butter are made by contract every year for the United States navy. See, also, CREAMERY and DAIRYING. For more detailed accounts of the processes of butter making, the reader is referred to H. H. Wing, *Milk and its Products* (New York, 1913); John Michels, *Creamery Butter Making* (Lansing, Mich., 1911); G. L. McKay and C. Larsen, *Principles and Practice of Butter Making* (New York, 1908); "Farm Butter Making," *United States Department of Agriculture, Farmers' Bulletin*, No. 541 (Washington, 1913).

BUTTERMILK. The liquid remaining after the butter fat has been separated from cream by churning. It consists largely of the water, sugar, casein, and ash of the cream, together with a small amount of lactic acid produced in the ripening of the cream (see BUTTER MAKING), which gives it a slightly acid taste. It also contains a small amount of fat, depending upon the completeness of churning, which failed to separate from the serum. Its composition varies, but is approximately as follows: water, 91; casein, 3; milk sugar, 4.8; fat, 0.5; and ash, 0.7 per cent. It is a healthful and nutritious beverage, much relished by some persons. Of late years its use as a beverage has increased. It is often made artificially, by the use of cultures of organisms. In many localities it is used to a considerable extent for feeding pigs, corn meal or some other grain being usually added to it. The pork produced upon it is of excellent quality. See BUTTER MAKING.

BUTTERNUT (so called on account of its oil), or WHITE WALNUT (*Juglans cinerea*). A large, wide-spreading American tree 50 to 75 or occasionally 100 feet high, ranging from New England to Georgia, and west to eastern Dakotas and Kansas, with nearly smooth bark and large compound leaves. The leaves and green nuts are clammy and pubescent. The nuts are well known and form agreeable food when dried; when taken green and pickled they are prized for the table. The nut contains as much as 4 per cent of fixed oil, which is sometimes extracted or expressed. Sugar can be made from the sap, in the manner of that made from the maple. The timber is useful for coach and cabinet work, posts, rails, and wooden bowls. The bark of the root is mildly cathartic. A dye-stuff was formerly prepared from the bark and husks and was quite widely used at one time for dyeing woolens, etc., a light yellow or reddish brown. For additional illustration, see Plate of BRAZIL NUT. See WALNUT.

BUTTER TREE. A name given to several tropical trees of different families the fruits of which yield complex fixed oils, having somewhat the appearance, and used for the purpose, of butter. Most of the butter trees of India and Africa belong to the genus *Bassia*, of the family Sapotaceæ; the butter trees of Guiana and Brazil to the genus *Caryocar* (q.v.), of the family Caryocaraceæ. The oil palm (q.v.) and the *Cocos butyracea* (see COCONUT) may also be regarded as butter trees, although not generally receiving that name.

The mahwa, madhuca, or mahowa of the East Indies (*Bassia latifolia*) attains a height of 50 feet and is found in stony and mountainous parts of India. The succulent corollas of the flowers are eaten raw, and a kind of spirits

is distilled from them. They also yield an essential oil. The seeds yield by expression a thick, greenish-yellow oil used as food and also for lamps. The Indian butter tree, *Bassia butyracea*, occurs in the more mountainous parts of India. The tree grows to a height of 50 to 60 feet. The wood is light and of no great importance. The fruit is eaten to some extent, and from the seeds is expressed the oil or butter, which is white and is extensively used. The Indian oil tree, *Bassia longifolia*, is a related species, the seeds of which are used in a similar manner to the others. The wood is said to resemble teak in its strength, hardness, and durability. *Bassia pallida* is said to yield gutta-percha. The butter tree of Central Africa, described by Mungo Park, is now known as *Butyrospermum parkii*, although formerly considered a species of *Bassia*. It produces the Galam butter, also called Shea butter (i.e., tree butter), which is highly valued and forms an important article of internal commerce in the interior of Africa. The seeds of the fruit, which resembles an olive, are dried in the sun, or in a peculiar kind of oven, and the kernels are then boiled in water, in order to obtain the butter from them, which not only keeps for a whole year without salt, but is also whiter, more solid, and more pleasant to the taste than the butter of cow's milk. This butter is used both as an article of food and of medicine. In addition to the oil obtained from the seeds, this tree yields what is called Shea gutta, a form of rubber.

Irvingia gabonensis of the family Simarubaceæ is a native of West Africa, where it grows to a height of 60 to 80 feet, with large trunks and spreading dark green top. The flowers are small and yellowish white. The fruit resembles a small mango in size and form and contains an edible nut. The flattened seeds yield about 67 per cent of an orange-yellow oil with a melting point of 108° F. After pressing out the oil the cake is used as food, being called Dika bread. All the products derived from the seed may be kept for considerable time without becoming rancid. Several other species of *Irvingia* are widely distributed and abundant in Western Africa and their nuts are used in the same manner as described above. Some species have a dense hard wood that is used for decking vessels, ceiling, etc.

BUTTER WORKER. A machine for working butter to remove the buttermilk and washings, to incorporate the salt, and to bring the butter into compact form. (See BUTTER MAKING.) Both hand and power workers are used; and there are also several forms of the combined churn and butter worker, in which the butter is worked within the churn without removing it. The latter are always operated by power. Butter workers reduce the labor of butter making and aid in producing a better butter. They make it unnecessary for the hands of the maker to come in contact with the product, and, as the grain of the butter is least affected by working it at a temperature of from 45° to 55°, this is an important advantage. They are now very generally employed in creameries and large dairies. See BUTTER MAKING.

BUTTERWORT (a wort, or root, secreting a greasy, butter-like substance) (*Pinguicula*). A genus of plants of the family Lentibulariaceæ. The species are small plants with rosettes of radical leaves that secrete a viscid fluid which catches insects. They are found in bogs and

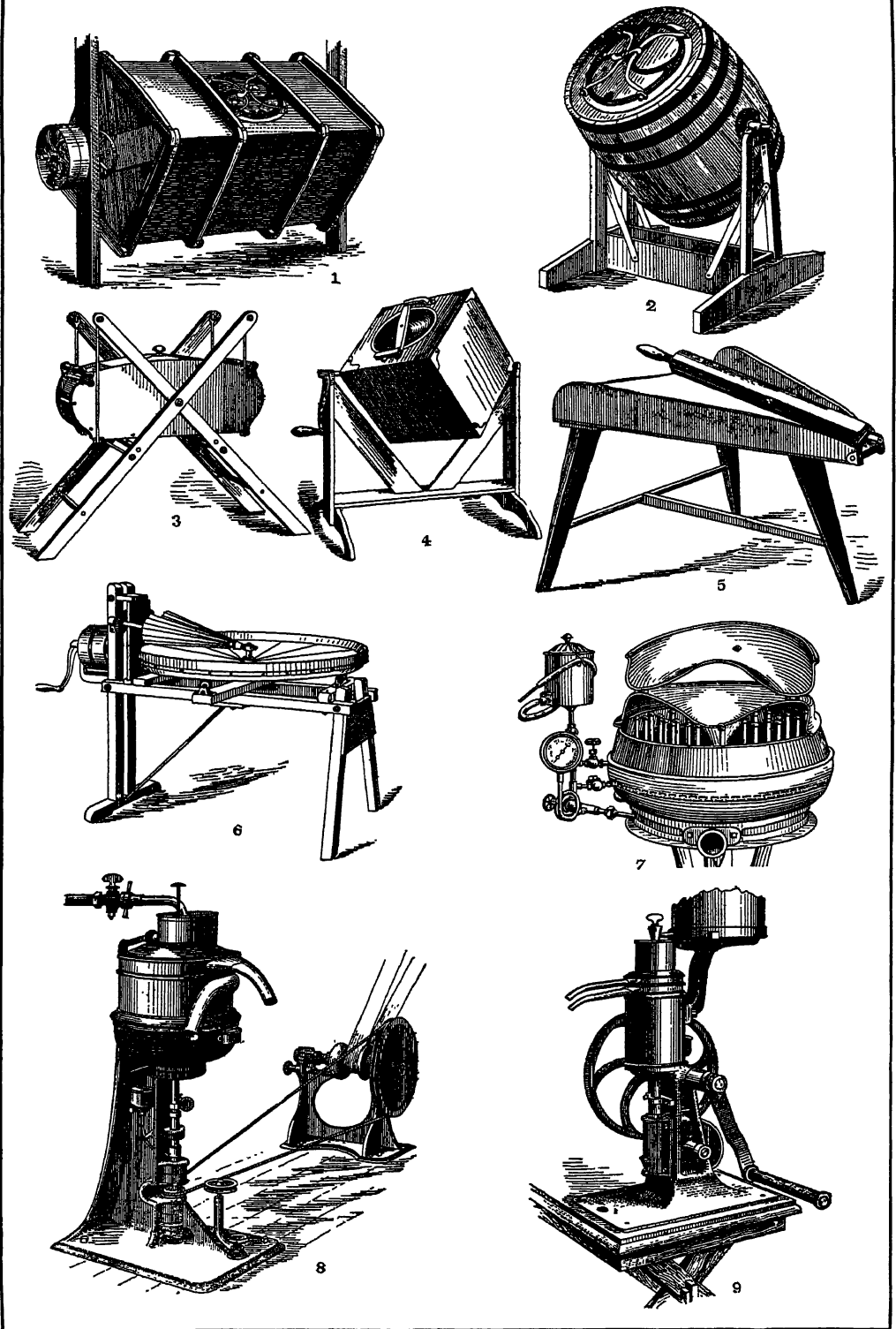
marshes of different parts of the world. The flowers have spurred, bilobed corollas and often have some beauty, especially those of *Pinguicula grandiflora*, a rare native of the south of France and of Ireland. The common butterwort (*Pinguicula vulgaris*) is abundant in the northern parts of Europe, Asia, and North America. It has the power of coagulating milk. The Laplanders pour reindeer milk warm from the animal upon the leaves of this plant, strain it, and set it aside for two or three days, till it acquires the consistency of cream and some degree of acidity, when it is with them a favorite article of food. A little of it in this state will produce the same effect on warm reindeer milk which was at first produced by the leaves of the plant. The origin of the English name, "butterwort," is sometimes referred to the power of coagulating milk, sometimes to the peculiar texture of the leaves.

BUTTERWORTH, HEZEKIAH (1839-1905). An American editor, juvenile writer, and poet. He was born at Warren, R. I., Dec. 22, 1839. After a common-school education Butterworth traveled widely in America and Europe and became (1871) editor of *The Youth's Companion*. Among his popular juvenile books are: *Zigzag Journeys* (1876-90); *A Knight of Liberty*; *The Boyhood of Lincoln*; *The Patriot Schoolmaster*; *The Wampum Belt* (1896). He published, also, *Poems for Christmas, Easter, and New Year* (1883); *Poems and Ballads* (1887), dealing with American history; and *Songs of History* (1887).

BUTTMANN, boot'man, PHILIPP KARL (1764-1829). An eminent German classical scholar. He was born in Frankfurt-on-the-Main and studied in Göttingen under Heyne. He became, in 1789, assistant in the Royal Library in Berlin and rose successively to be secretary and librarian (1811). He held at the same time (1796-1808) a professorship in the Joachimsthal Gymnasium in Berlin, which he afterward exchanged for a professorship in the newly founded university of that city. He died June 21, 1829. Buttmann is best known by his Greek grammars, the *Griechische Grammatik* (1792; 22d ed., 1869), and his *Griechische Schulgrammatik* (14th ed., 1862). His *Lexilogus* (1818-25; 2d ed., 1860) is a study of the difficult words in Homer and Hesiod; it was translated into English. His other important works are: *Ausführliche griechische Sprachlehre* (1819-27); editions of selected dialogues of Plato; Demosthenes *In Midiam*; Sophocles' *Philocetes*, Aratus' *Phænomena*, and scholia to the *Odyssey*. Valuable, also, was his *Mythologus* (1828-29), a collection of essays on myths of the ancients. He continued the great edition of Quintilian begun by Spalding.

BÜTTNER, but'nēr, KARL GOTTHILF (1848-1903). A German missionary and linguist, born in Königsberg. He studied theology at the University of Königsberg, worked from 1872 to 1880 under commission of the Rheinische Missionsgesellschaft in Damaraland, and at the same time conducted a school for native teachers at Otyimbingwe. From 1886 to 1889 he was inspector of the Ostafrikanische Missionsgesellschaft in Berlin, and in 1887 was appointed an instructor in the Seminary for Oriental Languages. He published a *Sprachführer für Reisende in Damaraland* (1888); a *Wörterbuch der Suahelisprache* (1890); *Hilfschulein für den ersten Unterricht in der Suahelisprache* (2d ed.,

BUTTER-MAKING MACHINERY



1-4. TYPES OF CHURNS FOR HAND AND POWER.
5-6. BUTTER WORKERS.

9. HAND SEPARATOR.

7. BABCOCK MILK TESTER.
8. POWER SEPARATOR.

1891); *Lieder und Geschichten der Suaheli* (1893).

BUTTON (Fr. *bouton*, bud, button, knob; literally, something pushing out, from *bouter*, to push; cf. Eng. *butt*). A term applied to the well-known appendages to dress used either for fastening or for ornament; to a sort of oblong latch used by joiners and cabinetmakers for fastening the lids of boxes, doors of closets, etc.; and, in technical language, to the mass of fused metal found at the bottom of a crucible or cupel after fusing or assaying.

The use of buttons as an article of dress is a product of modern civilization, as savages employ strings to fasten their clothing together. The Greeks and Romans also employed strings and girdles, the loose, flowing nature of their garments not requiring a more secure fastening. Buttons were first fastened to the clothing for ornamental purposes. The next step was the use of loops and buttons, the evolution of the buttonhole coming last of all. Buttons were first employed in southern Europe in the thirteenth or fourteenth century, and the manufacture of buttons in England dates only from the reign of Elizabeth as a trade of any importance. It has undergone several extraordinary changes, produced chiefly by the ever-varying fashions in dress; but also by some simple, though ingenious, inventions as well as by foreign competition. In Great Britain Birmingham has always been the principal seat of the button manufacture. What has been called the "Augustan age" of button making in that city included the latter portion of the eighteenth and the early part of the nineteenth centuries, when it was the fashion to wear coats "loaded with innumerable gilt buttons," and when employers on a moderate scale in this manufacture were making incomes of from £2000 to £3000 a year, and their workmen from £2 to £4 per week.

There are, in general, three kinds of buttons: those which are sewed to the garment through holes in the button itself; those which have shanks of metal; those which have, in place of the metal shank, a tuft or layer of felt or other cloth. The last two kinds are usually made on the shell plan, there being two plates of metal with a filling of pasteboard or cloth between, each having the edges turned back, and the one securely pressed into the other by machinery. The face of the button may be covered with cloth or may be of decorated metal. The back has a hole or collet in the centre, through which the metal shank or cloth tuft is introduced. The shell button was invented by B. Sanders, a Dane, who in 1807 moved from Copenhagen to Birmingham and there began the manufacture of buttons. He used a metal shank, and his son introduced the cloth tuft in its place. A further modification of the button was made later, when in place of the tuft a thin layer of cloth was secured by a metal plate to the back of the button, which was to be sewed on by means of this loose layer of cloth. At the close of the nineteenth century the tendency of fashion was to abandon in a considerable degree the shell button and to return to the older form with two, three, or four holes. Shanks, when used, are often fastened directly to a solid button, especially if it be of metal.

Among the other materials which have had a great success in their day, it is found that buttons made of hoof, under the name of "horn

buttons," introduced about the middle of the nineteenth century by E. Bassot of Paris, were for a good many years most extensively manufactured at Birmingham and sent to all parts of the world. The hoofs are first boiled in large kettles and then cut into fragments. These are shaped into buttons, which are then placed under a hydraulic press to stamp various patterns on them. Another machine bores the holes, and still another polishes them. An average factory produces from 1500 to 2000 gross per week.

Vegetable ivory has long been a favorite material for the manufacture of buttons, because it is readily dyed and turned in the lathes. (See *ATTALEA*.) It is the fruit of a South American palm called the corozza nut, and resembles in appearance true ivory, though somewhat softer. The nuts are first shelled by means of a rotary sheet-iron drum, provided on the interior with sharp, three-edged irons. The nuts are then cut into halves, out of which buttons are bored, or into blocks which are formed into buttons by a shaping machine. The dyeing process requires much skill and chemical knowledge, and each factory has its carefully guarded secrets. The buttons are dried in wire trays, where they are subjected to a certain degree of heat. They are then polished by means of a large, revolving, felt-lined barrel, by polishing stones, and by hand. In 1912 the thirteenth United States census reported that in 1909 there were 16 establishments engaged exclusively in the manufacture of vegetable ivory buttons with an annual product valued at \$3,573,115, while 9 establishments consumed some vegetable in connection with other materials entering into a product valued at \$949,969.

Metal buttons are a numerous class and include buttons for uniforms, trouser buttons, fancy buttons, which are gilt, stamped, chased, or enameled, and many cheap varieties in iron and other metals. Numerous kinds of composite buttons are also partly composed of metal. Glass buttons form another interesting branch, as do also porcelain buttons. Vulcanite buttons have been very extensively made in the United States. As to other materials, a Birmingham manufacturer once said it would be easy to write out a long list from which buttons have been made, but very difficult to name one from which they have not been made. In making metal buttons circular disks, called "blanks," are first cut out of sheet brass or other metal by means of fly presses, usually worked by girls. The fly press consists of a vertical iron screw with a triple thread, to which screw is attached a horizontal arm, bending downward at the end to form a handle. A punch attached to the press rises and falls with the motion of this handle and rapidly cuts out the blanks. When large quantities of one pattern are required, a self-feeding, self-acting machine is used, which cuts out the blanks in rows at one blow. After being annealed, the blanks are next made convex by a blow from a stamp. The shanks are formed of wire by a separate machine, which cuts off pieces and bends them into loops of a required form. When these are soldered on, the buttons are dressed on a lathe. They are then gilded and burnished; some, however, are only lacquered; and some, though gilded, are finished in a dead or frosted style. Livery and other buttons having a device

in strong relief are stamped by a die placed in a stamping press. See DIES.

Buttons with holes, when of pearl shell, bone, wood, or ivory, are cut with a tubular saw, turned separately in a lathe, and drilled. When of metal the blanks are punched, then stamped in dies to the required form; the holes are punched and finished smooth so as to round the sharp edges that would otherwise cut the thread. Glass buttons are usually made by taking a rod of glass of any color, softening the end by heat, and pressing it into a mold, each half of which is fixed to one limb of a pair of pincers. The shank is placed in a hole in the mold before the melted glass is inserted.

The manufacture of pearl buttons was introduced into the United States about 1855. The raw material at first came from China and entered free of duty. In Bohemia and elsewhere such buttons are manufactured in families and by the poorer classes often as a house industry in which all members of the family can engage, the smaller children sewing the buttons on cards. In Austria, France, and Germany the work has largely been done by convicts. The shells are brought from the Red and Mediterranean seas, and there is said to be great danger that the beds will be exhausted, as it takes them 20 years to mature.

In recent years machinery has been introduced into the button-making factories of Japan, and with the abundant supply of shells found on the neighboring islands and imported from India and the Dutch East Indies the industry has become well developed. In 1907 there were exported from Japan 1,472,902 gross of pearl buttons valued at \$271,564, or more than double the amount in 1903; Germany, Great Britain, and France being the principal customers.

During the last decade of the nineteenth century the manufacture of pearl buttons in the United States received a great impetus, owing to the discovery of fresh-water mollusks in the Mississippi River admirably adapted to this use. Of the 400 species of mussels found in the river, several varieties are suitable for button manufacture, but the best is the *Quadrula ebena*, or "niggerhead," which has a very thick shell, a black or dark-brown outside skin, and a glistening white interior. The fishing is conducted throughout the year, even in the coldest weather, under the ice, when shells are in best condition, being less brittle. On account of the shallowness of the river, fishing is extremely easy, and is carried on so unceasingly, even during the spawning season, that unless measures are taken to regulate the matter, the banks will inevitably be exhausted. Another enemy to the life of the mollusks is the sewage pollution of the river. After the shells are purchased from the fishermen, they are soaked in barrels of fresh water from three to six days, to render them less brittle. They are next sawed into blanks with saws formed by steel strips bent into tubular form. A fine spray of water plays on the shell, to keep it cool and lessen the dust, which is very irritating to the respiratory organs. The back of the button is then ground, to remove the skin and even the surface, and the front is polished and the depression made by means of an emery wheel. The holes are then drilled, and the buttons are ready for sorting, carding, and packing. The manufacture of buttons in the Mississippi valley began at Muscatine, Iowa, in 1890. It is

now the principal business along a section of the river over 200 miles in length, extending from Fort Madison, Iowa, to Sabula, Iowa.

In 1905 there were manufactured in the United States 11,405,723 gross of fresh-water pearl buttons, valued at \$3,359,167. The unit of measure in button manufacture is a line, or one-fortieth of an inch, and it is stated that—in the United States at least—the cost of manufacture varies pretty directly with the diameter or number of lines of the button. The whole subject of the pearl-button industry of the Mississippi valley was investigated in 1899 by the United States Fish Commission, from whose reports much information concerning the industry can be obtained.

Brass buttons were manufactured in Philadelphia as early as 1750, and, soon after, the manufacture of hard-wood buttons was begun by Benjamin Randolph in the same city. The first button factory in Waterbury, Conn., which city became a centre of the American metal-button industry, was established about 1800. The manufacture of covered buttons by machinery instead of by hand was begun in 1827 by Samuel Williston, of Easthampton, Mass. Horn buttons were made as early as 1812, the hoofs of cattle forming the raw material. Vegetable-ivory buttons have been made in the United States since 1859, and this branch now ranks third in the button industry. Various kinds of composition buttons have been made since the industry was started at Newark, N. J., in 1862, where a button resembling vegetable ivory was produced from certain fossil and vegetable gums, combined with finely comminuted carbonate of lime, feldspar, or mica. Composition buttons are now made of many materials, among them the Irish potato, which, when combined with certain acids, becomes as hard as stone. Other materials are the casein from skim milk, blood, and brown seaweed. Prior to 1900, 348 patents for button-machines and 1355 for the making of buttons had been issued by the United States Patent Office. A unique branch of the button industry is the manufacture of campaign and society buttons, and of buttons on which photographs are reproduced or ornamental designs for purposes of advertising or ornament. These are usually made from celluloid.

The centres of the different branches of the button industry in the United States are as follows: bone buttons, Pennsylvania; brass buttons, Connecticut, New York; cloth buttons, Massachusetts; composition buttons, Pennsylvania, New York; fresh-water pearl-button blanks, Iowa, Illinois; fresh-water pearl buttons, New York, Iowa, Pennsylvania; horn buttons, Connecticut; ocean-pearl buttons, New York; New Jersey, Pennsylvania; paper buttons, New Hampshire; tin buttons, New Jersey; vegetable-ivory buttons, New York, Massachusetts, New Jersey. In 1850, according to the United States census of manufactures, 59 button-making establishments in the United States had an output valued at \$964,359, while in 1905 the 275 establishments reported valued their productions at \$11,133,769. At the latter year the capital invested in the industry amounted to \$7,783,900. In the thirteenth United States census (1910) the returns for manufactures published in 1912 gave for the button industry in the United States at the end of the year 1909 a total of 444 establishments, affording employment to 18,004 persons. These had a

capital of \$15,640,000, and from raw material valued at \$9,541,000 turned out a finished product valued at \$22,708,000, an increase of 104 per cent over 1904. In 1913 the value of buttons exported from the United States was \$849,282. The value of imported buttons declined from \$2,176,046 in 1891 to \$652,961 in 1908, but later increased, amounting to \$1,855,843 in 1913.

In China a knob, or so-called button, is worn on the hat as a sign of rank, there being nine ranks, each of them signified by the material of which the button is made. The highest rank is indicated by a ruby; second by a coral; third, a sapphire; fourth, lapis lazuli; fifth, crystal; sixth, white stone; seventh, plain gold; eighth and ninth, differently marked gold. For a discussion of European processes of button manufacture, consult Lutter, *Die Knopfabrikation* (Vienna, 1907).

BUTTON, SIR THOMAS (?-1634). An English navigator, the successor of Henry Hudson in the search for a northwest passage. In 1612-13 he was frozen in and wintered on the west coast of Hudson Bay. The next summer he explored that coast, returning to England in the autumn. His old age was embittered by a series of disputes with the Admiralty.

BUTTON QUAIL. A peculiar quail-like bird of the genus *Turnix*, family Turnicidae, order Hemipodii (see HEMIPODE), found in the tropical and subtropical portions of the Old World. It is also called bustard quail, bush-quail, ortygan, and hemipode. About 25 species are known, one of which—the torillo of Spain (*Turnix sylvatica*)—occurs in southern Europe. They are almost the smallest game birds known, and frequent wooded places, in small coveys, feeding on seeds, berries, and insects, and frequently visiting plantations. The females are more brightly colored than the males and take the active part in courtship, their extreme pugnacity being taken advantage of in India in trapping them by the help of a decoy, which they try to assail.

BUTTON'S COFFEEHOUSE. A famous place of assemblage for wits in Addison's time, situated in Russell Street, Covent Garden, London. See CLUB.

BUTTONWOOD. See PLANE.

BUTTRESS (OF *boutreterets*, from *bouter*, *boter*, to thrust). A pile of masonry built up against a wall to strengthen it against lateral pressure or thrust. When this pressure is exerted at separate points, as in the case of buildings having roofs carried by trusses each of which exerts an outward thrust or pressure at its foot on each side wall, or of buildings with groined vaulting whose thrust is concentrated at isolated points (see VAULT), a buttress at each of these points of pressure renders it unnecessary to construct the whole wall of the thickness required only at those points. Even when the pressure is continuous along the whole extent of the wall, as with a retaining wall, buttresses at regular intervals, not too far apart, will supply the necessary strength. This is, indeed, the most common and familiar use of the buttress in modern work (Fig. 1).

In certain forms and styles of architecture buttresses play an important part. They reached their highest development in the Gothic architecture (q.v.) of western Europe in the Middle Ages, as will presently be explained. In the pier-and-lintel architecture of Egypt and Greece

(see ARCHITECTURE) they were not required, as that form of construction produces no lateral thrusts. In Assyro-Chaldean architecture vaulting was used to some extent, but the walls were

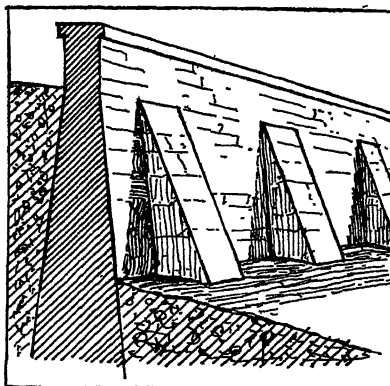


FIG. 1. RETAINING WALL BUTTRESSES; SECTIONAL PERSPECTIVE VIEW.

throughout of such enormous thickness that buttresses were unnecessary. It was the Romans who, with their keen engineering instinct, first developed the scientific use of buttressing, made necessary by their use of vaulting. They employed both the barrel vault, which thrusts along the whole length of the structure, and the groined vault, which concentrates the thrusts at isolated points. It was to resist these concentrated thrusts that they evolved the system of *internal* buttressing. By this system the plan of the building is so devised that it provides, within the exterior walls, great masses of masonry set transversely to the length of the building so as to oppose most effectively the outward pressure or thrust of the vaulting. This is seen to perfection in the great halls of the *thermæ* or baths and in the great vaulted Basilica of Maxentius

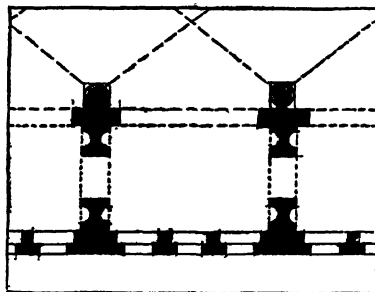


FIG. 2. INTERNAL BUTTRESSING IN BASILICA OF MAXENTIUS, ROME (PARTIAL PLAN).

tius (Fig. 2). In these, moreover, the buttress was carried up above the roof of the side chambers or aisles, between the great clearstory windows, forming *external* buttresses, the prototypes of the later Romanesque and Gothic systems of buttressing. Moreover, the engaged columns which adorned the exteriors of the Colosseum and similar arcuated buildings, served in a measure as external buttresses at the points of chief stress from the internal vaulting of the aisles and passages.

The Byzantine architects employed internal buttressing chiefly in their domed and vaulted

buildings, but external buttresses were built between the windows at the base of the dome, as at Hagia Sophia, and in this building the

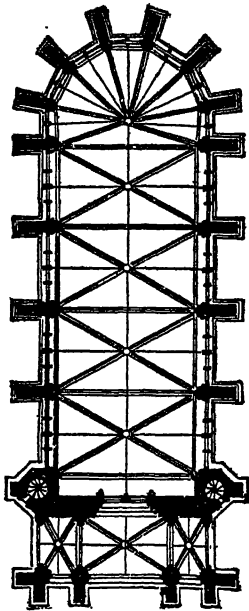


FIG. 3. EXTERNAL BUTTRESSING ON THE SAINTE CHAPELLE, PARIS (PLAN).

great internal buttresses of the four main piers supporting the dome were carried up externally somewhat after the Roman fashion just described.

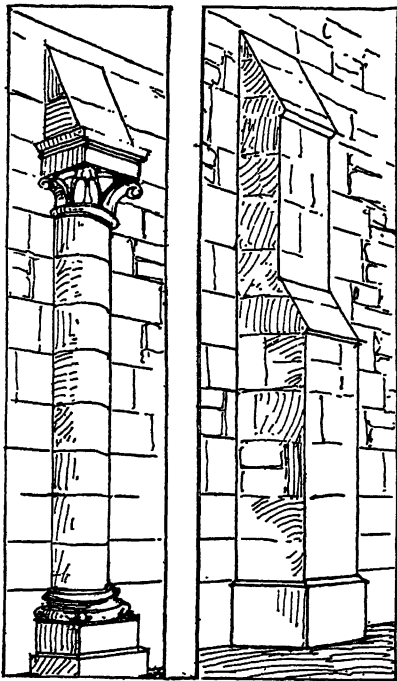


FIG. 4. a. ROMANESQUE COLUMNAR WALL BUTTRESS.
b. TYPICAL GOTHIC WALL BUTTRESS.

With the development of Monastic or Romanesque architecture in western Europe after

1000 A.D., vaulting in stone was increasingly used, especially at first in France, and the problem of buttressing presented itself insistently for solution. So long as barrel vaults were used over the naves, light and lofty structures were impossible, as the piers between nave and aisles

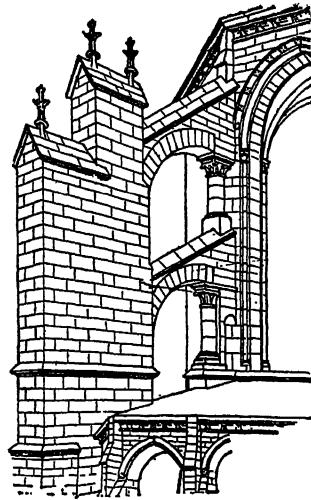


FIG. 5. EARLY FRENCH GOTHIC FLYING BUTTRESS.

must be of great thickness to carry the heavy superstructure. The first step in advance came by the introduction of half-barrel vaults over the side aisles, by which the thrust of the nave vault was partly abutted and partly transmitted to the heavy external walls. Occasionally a clearstory was introduced, with buttresses between the windows, extending down the aisle vaulting. But the greatest advance was

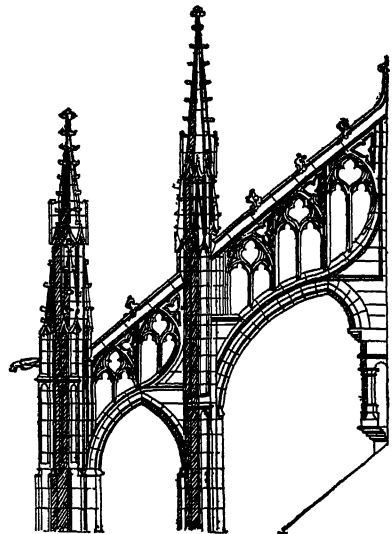


FIG. 6. LATE GOTHIC (FLAMBOYANT) FLYING BUTTRESS FROM ST. WULFRAND, ABBEVILLE.

made when groined vaulting was introduced over the nave, and the resulting concentrated thrusts were abutted in part and transmitted in part by isolated half-arches, not to massive external walls but to separate buttresses built against the external walls—solid towers or piles of stone,

which in the later Gothic churches were carried up far above the side-aisle roofs and crowned with pinnacles (Figs. 5 and 6). This combination of the flying arch and buttress, commonly called the *flying buttress*, received its chief development in France between 1160 and 1300, and is the most conspicuously distinctive characteristic of Gothic architecture, both structurally and decoratively. The row of stately pinnacled buttresses with their lightly springing half-arches give to such mediæval churches as the cathedrals of Paris, Amiens, Reims, and Cologne an accented picturesqueness of silhouette not found in any other style. By their use the internal masonry, reduced to the sole function of vertical support, could be made far lighter than formerly; walls became mere screens, having no function of support; the building was a skeleton framework of stone, with thin screen walls and vast traceried windows between the deep external buttresses. It is incorrect to say that the Gothic system was one of "balanced" thrusts; the flying arches do not "balance" the vault thrusts, but *transmit* them to the buttresses. In the case of five-aisled churches the flying arches sometimes leaped the two side aisles in a single span; sometimes in two spans with an intermediate buttress over each of the intermediate aisle piers. The first system is seen in the choir of Notre Dame, Paris; the second in those of Reims and Amiens. In many cases two half-arches were used over each aisle, one above the other, the better to stay the vault thrust, as at Reims. The later buttresses (fifteenth century) were often highly ornate with multiplied pinnacles, and tracery on the flying arches. Churches and chapels of a single aisle required, of course, no flying arches; the buttresses rise against the side walls up to and above the roof, as in the Sainte Chapelle, Paris (Fig. 3), and King's College Chapel, Cambridge, England. Such buttresses were used in England not only for vaulted buildings, but also for halls and chapels with heavy-trussed timber roofs, as Westminster Hall, London. The complete flying buttress is less common in England than in France, the English cathedrals being lower, their clear-stories less lofty than the French, and the abutment of the vaulting being often effected by concealed constructions under the side-aisle roofs. German builders followed French precedents in most cases. In Italy tie rods of iron across the naves generally rendered buttresses unnecessary; those that exist (except at Milan) are usually of quite rudimentary design (the Frari Church, Venice, San Francisco, Bologna). Except in modern Gothic work external buttressing is seldom necessary in present-day buildings. Its chief occurrence is in armories, railway stations, and factories, where the thrust of huge roof trusses or the vibration of floors due to machinery compels the reinforcement of the walls between the windows at regular intervals.

BUTTRICK, WALLACE (1853-1926). An American clergyman, born at Potsdam, N. Y. He graduated from the Rochester Theological Seminary, was ordained to the Baptist ministry in 1883, and thereafter held pastorates in New Haven, Conn. (1883-89), St. Paul, Minn. (1889-92), and Albany, N. Y. (1892-1902). In 1902 he became secretary of the General Education Board.

BUTUNG. See BUTON.

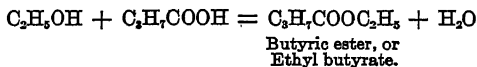
BUTURLINOVKA, búr-l'ôv'kâ-nôf'kâ (originally the estate of Count Buturlin), or PE-

TROVSKOYE. A village in the government of Voronezh, Russia, 35 miles southeast of Bobrov. It has a number of tanneries, flour mills, and brickyards. The place is notable because of its many windmills. Pop., 1897, 23,400.

BUTYRELLITE. See BOG BUTTER.

BUTYRIC ACID (Lat. *butyrum*, butter; see BUTTER), $C_4H_8O_2$. One of the so-called fatty acids. It is an important constituent of butter, in which it exists in the form of a glyceride, i.e., an ester of glycerin. The free acid has a disagreeable odor similar to that of stale perspiration, in which it is found in small quantities. It is a thick liquid, somewhat lighter than water, and boiling at $163^\circ C$. It mixes with water in all proportions. It is usually prepared by a double process of fermentation. First, milk sugar is exposed to the action of the *lactic ferment* present in the air, which transforms the sugar into lactic acid. The lactic acid solution thus obtained is then subjected to the action of another ferment, the *butyric ferment*, present in decaying cheese; and by this second process of fermentation the lactic acid is gradually transformed into butyric acid, provided the solution is kept neutral by the addition of chalk. The butyric of lime thus obtained is decomposed with dilute hydrochloric acid, and the free butyric acid is separated by distillation. Butyric acid may also be prepared from butter by boiling (saponifying) with caustic potash. The acid called *isobutyric acid* has the same molecular composition as butyric acid, though the two differ distinctly in their physical and chemical properties; thus isobutyric acid boils at $155^\circ C$. and, unlike butyric acid, has a limited solubility in water. The constitutional formula assigned to butyric acid is $CH_3CH_2CH_2COOH$; that assigned to isobutyric acid is $(CH_3)_2CHCOOH$.

BUTYRIC ESTER, or PINEAPPLE OIL. An exceedingly fragrant oil obtained by distilling a mixture of butyric acid, alcohol, and sulphuric acid. The butyric ester which passes over is generally mixed with alcohol and sold in commerce as *artificial pineapple oil*. Its odor resembles that of pineapples. The substance is used in the manufacture of fruit candy and in perfumery. In its formation ordinary alcohol (C_2H_5OH) combines with butyric acid (C_4H_7COOH), according to the following chemical equation:



See ESTERS.

BUTZER. See BUCER.

BUXTEHUDE, búks'te-hô'de, DIETRICH (1637-1707). A noted German organist and composer, born at Elsinore, Zealand, Denmark. Nothing is known regarding his musical training. He must have achieved a considerable reputation by 1668, for in that year he was appointed organist of the Marienkirche of Lübeck, at that time one of the most important posts of the sort in Germany. There he exercised a powerful influence upon the musical history of his time. Not only was he distinguished as an organist, but he established the "Abendmusiken," famous throughout Germany even into the nineteenth century. These were services, comprising organ music and concerted works for chorus and orchestra, given annually in the Marienkirche, on the afternoons of the five Sundays preceding Christmas. It is recorded that to

hear these performances in 1705 Bach walked 50 miles, from Arnstadt to Lübeck, where he prolonged his month of leave to three months. Buxtehude was surpassed in the choral by the Pachelbel (q.v.) school, but he was eminent as a pioneer in purely instrumental music, later carried to its full development by Bach. Many of his compositions have been lost. Fourteen *Choral-Bearbeitungen* have been edited by Dehn (Leipzig), and the organ works that are still extant by Spitta (2 vols., Leipzig, 1876-78). Various separate pieces have appeared in Busby's *History of Music* (London, 1819); Commer's *Musica Sacra*, vol. i (26 vols., Berlin, 1899 et seq.); Ritter's *Kunst des Orgelspiels* (Leipzig, 1877); and other works. Consult A. Pirro, *Diétrich Buxtehude* (Paris, 1913).

BUXTON (AS. *boc*, Ger. *Buche*, Scotch, *buck*, Eng. *beech* + AS. *tun*, Eng. *town*). A market town and watering place in Derbyshire, England, 36 miles northwest of Derby (Map: England, E 3). It lies from 1000 to 1150 feet above the sea, in a deep valley, surrounded by hills and moors, which have been tastefully planted, the only approach being by a narrow ravine. Buxton is famous for its calcareous springs, tepid (82° F.) and cold (each discharging 60 gallons of water per minute), and its chalybeate springs. It is visited annually from June to October, by 12,000 to 14,000 persons, the waters being taken for indigestion, gout, rheumatism, and nervous and cutaneous diseases. There is a small industry in ornaments made from alabaster and spar. Buxton is in direct railway communication with London, 160 miles distant. Near Buxton are Diamond Hill, famous for its crystals, and Poole's Hole, a stalactitic cavern about 560 yards long. About 5 miles east of Buxton is Chee Tor, a perpendicular limestone rock 300 feet high. Pop., 1891, 7540; 1901, 10,181; 1911, 10,024. The Romans had baths here. Mary Queen of Scots resided for some time at Buxton when in the custody of the Earl of Shrewsbury. Consult A. Black and C. Black, *Guide to Buxton and the Peak Country* (London, 1910).

BUXTON, JEDEDIAH. See CALCULATORS, REMARKABLE.

BUXTON, SYDNEY CHARLES (1853-). An English statesman, educated at Trinity College, Cambridge. In 1886 he was elected member of Parliament for Poplar. He was a member of the Conciliation Committee in the great dock strike of 1889, and served also on the Royal Commission of Education and the Income Tax Committee. From 1892 to 1895 he was Under-secretary for the Colonies, and in 1905-10 was Postmaster-General. While occupying the latter office, he succeeded in introducing penny postage to the United States and reduced postage on magazines sent to Canada. He was appointed President of the Board of Trade and Privy Councillor in Mr. Asquith's cabinet in 1910, and in 1914 became Governor-General of South Africa. A frequent and effective speaker on the government side in the House of Commons, he was largely responsible for the Copyright Act and the Insurance Act, both passed in 1911. He took a prominent part also in the settlement of the railway strike of the same year. His writings include: *Handbook to Political Questions* (1892); *Political Manual; Finance and Politics: an Historical Study* (1793-1885); *Handbook to Death Duties; Mr. Gladstone as Chancellor of the Exchequer: A Study* (1901); *Fishing and Shooting* (1902); *The Fiscal Question* (1904).

BUXTON, SIR THOMAS FOWELL (1786-1845). An English philanthropist. He was born at Earl's Colne, Essex, the eldest son of a wealthy family. At his graduation from Trinity College, Dublin, at 21 years of age, he was asked to represent the university in Parliament, but declined. He married a sister of the celebrated Mrs. Elizabeth Fry in 1807, entered business as a brewer, and by his energy and great business ability ultimately accumulated a large fortune. He interested himself also in local charities and in educational and religious enterprises. In 1818 he entered Parliament as member for Weymouth, which he continued to represent for about 20 years, taking a leading part in all debates on such questions as the amelioration of criminal law and of prison discipline, the suppression of the suttee in India, and the emancipation of slaves. The latter, in particular, engrossed a large share of his activity for many years, and no one displayed more zeal and firmness in its advocacy. In 1837 he was rejected by his constituency and refused ever after to stand for a borough. In 1840 he became a baronet. For his life, consult *Memoirs of Sir T. F. Buxton, Bart.*, ed. by his son, Charles Buxton (London, 1872), and Binney's *Sir T. F. Buxton: A Study for Young Men* (1845).

BUXTORF, buks'torf, JOHANN, THE ELDER (1564-1629). A German Orientalist. He was born at Kamen, Westphalia, Dec. 25, 1564. His student years were spent at Marburg, Herborn, Heidelberg, Basel, Zurich, and Geneva, and after traveling through Germany and Switzerland he settled at Basel, where he became professor of Hebrew in 1591, at the instance of his teacher, Grynaeus, and there died of the plague, Sept. 13, 1629.

It was while studying at Herborn under Piscator that he imbibed his love for Hebrew, to the study of which and of Rabbinical literature he devoted his life. He associated much with learned Jews, and so great was his acquaintance with Jewish writings that he was frequently consulted by Jews on matters relating to ceremonial laws. His learning gained for him the title "Master of the Rabbins." His most important works are *Synagoga Judaica hoc est Schola Judæorum* (1604); his *Biblia Hebraica Rabbinica* (1618-19); his *Tiberias; sive Commentarius Massorethicus* (1620); his *Lexicon Chaldaicum, Talmudicum, et Rabbinicum* (1639), a most comprehensive work, of which a new edition was issued by Fischer (1866-74); and his *Concordantiæ Bibliorum Hebraicorum* (1632; new ed. by Bär, 1862-63). The two last-named works were, however, not completed by Buxtorf and were published after his death in completed form by his son, Johann Buxtorf. Consult Kautsch, *Johann Buxtorf der Ältere* (Tübingen, 1880).

BUXTORF, JOHANN, THE YOUNGER (1599-1664). Son of the preceding, also an Orientalist. He was born at Basel, Aug. 13, 1599. At the age of 12 he entered the university at Basel, and at 16 he received the diploma of Master of Arts from the hands of his father. After finishing his studies he proceeded to Heidelberg and subsequently to Geneva. In 1623 he was offered a chair of logic at Lausanne, but declined, preferring to return to Basel, where, after holding various clerical offices, he was elected, in 1629, to succeed his father at the university. He remained in Basel, holding during his residence various chairs until his

death on Aug. 16, 1664. He was married four times, his first three wives dying shortly after marriage. Of his children, all died young except two boys, one of whom, Johann Jacob, succeeded his father in the chair of Hebrew. Much of his life was spent in controversies regarding disputed biblical and theological questions, notably regarding the antiquity of the vowel system in Hebrew. His learning was very great, but his doctrinal attitude led him to defend against Morin and Cappel a wholly indefensible position, and the scholarship of to-day, among Protestants as well as Catholics, maintains, with his opponents, that the vowel points were not introduced before the seventh century A.D. Besides his *Lexicon Chaldaicum et Syriacum*, which appeared (Basel, 1622) with a preface by his father, he completed and published from the manuscripts of his father the *Lexicon Chaldaicum, Talmudicum, et Rabbinicum* (Basel, 1639) and *Concordantie Bibliorum Hebraicorum* (Basel, 1632).

BUX'US. See Box.

BUYS-BALLOT, bois'ba'lô', CHRISTOPH HENDRIK DIDERICUS (1817-90). A Dutch meteorologist, born at Kloetinge, and educated at the University of Utrecht. He became professor of mathematics in the university (1847) and professor of experimental physics (1870). In 1854 he was appointed director of the Royal Meteorological Institute at Utrecht. He was the first to make a practical application of a system of storm signals in Europe and invented the anemochroscope, used on the Dutch coast to communicate to vessels at a distance the direction from which wind or storm is to be expected. He is, perhaps, best known for the Buys-Ballot Law, a statement expressing the connection of wind directions with a given storm centre. He was active in endeavoring to obtain an international uniformity in meteorologic observations. His publications include *Changements périodiques de la température* (1847), *Eenige regelen voor te wachten van weerverandering in Nederland* (1860), and 40 volumes of the *Annual of the Meteorological Institute*.

BUZĂU, bôo'zē-ū, **BUZEU**, or **BUSEO**. The capital of the Department of Buzău, in western Wallachia, Rumania, on the Buzău River, and on the Rumanian-Bucharest Railway (Map: Balkan Peninsula, F 2). It is an episcopal see, with a cathedral and other public buildings. Buzău has a considerable domestic trade in grain, hides and skins, timber, and petroleum. Pop., 1899, 21,561; 1905, 23,025; 1909, 23,726.

BUZFUZ, SERJEANT. A caricature of a contemporary sort of barrister in Dickens's *Pickwick Papers*. He is counsel for Mrs. Bardell in her breach of promise suit against Mr. Pickwick. His firm has taken up her case thinking that the latter will pay the costs; and when they lose their fees by the defendant's choice of jail instead of blackmail, they very nearly land their own client in prison. Buzfuz is inimitable at showing dark intentions in the most innocent actions and speeches of Pickwick.

BUZULUK, bôo'zôo-lôok' (founded in 1756 on the *Buzuluk* River). A district town in the Government of Samara, Russia, 110 miles east-southeast of the city of Samara (Map: Russia, H 4). The chief industries include the casting of church bells and the preparation of sheepskins. Pop., in 1897, 14,500.

BUZZARD (OF. *buzart*, Fr. *buse*, from LL. *buisio*, Lat. *buteo*, a kind of falcon or hawk).

A hawk of the genus *Buteo*, a widely distributed group of some 33 forms. They are of medium or rather large size, heavy-bodied, of strong but measured flight. They are not so spirited as the falcons (q.v.) and capture their prey more stealthily. They live very largely on the smaller mammals, such as field mice and squirrels and even insects, but they also capture birds and are occasional visitors to the poultry yard. The wings are rather long and pointed, exceeding the tail; feet robust, with tarsi partially feathered. The type of the genus is the common buzzard of Europe (*Buteo buteo*, or *vulgaris*), which measures about 4 feet across the wings and is pre-vaillingly brown, with a considerable mixture of black on the upper parts and of white or grayish white on the under. In America this species is replaced by Swainson's buzzard (*Buteo swainsoni*), which is one of the commonest large hawks from the Mississippi westward to the Pacific. It occasionally strays eastward through the Northern States. In color it is only slightly different from the European species, but it is somewhat larger. Some 9 or 10 other buzzards occur in the United States, but only 2 or 3 of them are widely distributed. The most common of these is the red-tailed hawk (*Buteo borealis*), found over all North America. The tail of the adult bird is a rich rufous, tipped with white and with a narrow black band near the tip. The redtail is one of our largest hawks, measuring from 4½ to 5 feet across the wings. Though often called the "hen hawk," it seldom attacks poultry and feeds largely on frogs and insects as well as mice and squirrels. The nest is a large affair of sticks built in a tree from 30 to 70 feet from the ground. The eggs, laid very early in the spring, are usually three or four in number, dull white, somewhat marked with brown. Closely allied to the redtail is the red-shouldered hawk (*Buteo lineatus*), about the same size, but easily recognizable by the rufous wing coverts, forming a bright patch at the bend of the wing. The red-shouldered hawk has about the same range as the redtail and is often confused with it under the names "hen hawk" and "chicken hawk," but poultry is really a very insignificant part of its diet. Its breeding habits are similar to those of the redtail. The broad-winged hawk (*Buteo latissimus*, or *platypterus*) is much smaller than either of the preceding and is confined to the eastern part of the continent. It feeds very largely on insects.

The name is often extended to the genus of which the rough-legged hawk (*Archibuteo lagopus*) is the best-known species. These buzzards are easily recognized by the feathered tarsus, the feathers extending clear to the toes in front. The roughleg is one of the most wide-ranging hawks known, being found in the Old World from Lapland to the Cape of Good Hope and in America as far south at least as Virginia. It is somewhat darker than the European and is ranked as a separate subspecies. (See Plate of EAGLES AND HAWKS.) In the western part of North America is found a closely allied species, the "California squirrel hawk," which is considered "one of the largest, handsomest, and most distinctively marked hawks of North America." Besides these various buzzards already mentioned, about 20 other species are known, found in all parts of the world. In America the name "buzzard" is commonly given to the American vultures (q.v.), of which the common turkey buzzard is the most familiar example.

BUZZARD EAGLE. See **EAGLE**.

BUZZARDS BAY. A bay on the south coast of Massachusetts, about 30 miles long by 5 to 10 miles wide, sheltered from the ocean and partly separated from Vineyard Sound (q.v.) by the Elizabeth Islands (Map: Massachusetts, F 4), which form a portion of the southern boundary. Buzzards Bay is a favorite summer resort. In the bay are the harbors of New Bedford, Wareham, Sippican, Nasketucket, and Mattapoisett.

BY, JOHN (1781-1836). A Canadian military engineer, the founder of Bytown, now Ottawa, Canada, and constructor of the Rideau Canal. He was born in England, was educated at the Royal Military Academy, Woolwich, and came to Canada in 1802. During his nine years' residence there he built the boat canal at the Cascades above Montreal, four martello towers outside the walls of Quebec, and a model of the latter city which was sent to Chatham, England. After nearly a year's service in the Peninsular War (q.v.), he was for nine years in charge of English gunpowder mills in Kent and Essex. In 1826 he was sent to Canada to construct a military waterway, between the Great Lakes and the tidal waters of the St. Lawrence, which would be free from interference by the United States; the St. Lawrence route between Montreal and Kingston had been difficult and dangerous in the War of 1812. By's work resulted in the Rideau Canal, completed and opened in 1832. (See **RIDEAU**.) The tiny settlement at the mouth of the canal, consisting of houses and barracks built by By for himself and his men, was named Bytown; in 1858 this place, under the name Ottawa (q.v.), became the capital of the Province of Canada. By left for England in 1832, owing to complaints against him on the ground of undue expenditure in the construction of the canal. He appeared before a parliamentary committee which acquitted him of extravagance, but stultified its report by including therein an expression of regret at the cost of the canal. By, whom subsequent research has completely exonerated, was deeply disappointed and wounded by the report, and died after four years of broken hopes and health.

BY-BID/DING. A fictitious bidding at an auction sale on behalf of the vendor, at his request or with his connivance, for the purpose of enhancing the price and without the intent of buying. Another name for this practice is "puffing." In England, secret by-bidding or puffing by a single bidder will vitiate a sale at an auction advertised as being without reserve. Such appears to be the rule generally prevailing in the United States. When the auction is not announced to be without reserve, there is considerable authority both in England and in the United States for the view that a single puffer will not invalidate the sale, if he is employed to prevent a sacrifice of the property at too low a price and does not run the price up unduly. The safe and honorable course for an owner, however, who wishes to save his property from sacrifice at auction is to give notice that he reserves the right of bidding or of withdrawing the property if satisfactory bids are not made. An agreement by the vendor to pay the puffer for his services is unenforceable whenever the services are illegal. See **AUCTION**; **CONTRACT**.

BYBLOS, βίβλος (Gk. βύβλος). An ancient city of Phœnicia, more properly Gyblos, now

called Jebel, situated at the base of the Lebanon, about half-way between Tripoli and Beirut. It is frequently mentioned in Phœnician inscriptions under the form GBL and appears in cuneiform documents as early as the fifteenth century B.C. as Gubli, in later inscriptions also as Gubal. From the Amarna tablets it is evident that it was a place of considerable importance already at a remote period, and was prominently involved in the western campaigns of Tiglath-pileser IV (745-728) and Shalmaneser V (728-722). How the change from initial G to B was brought about is not known, but among Greek writers (e.g., Strabo) it is invariably known as Byblos. Byblos was the seat of worship of Adonis, of Tammuz, and of Astarte under the name of Baalat-Gublu (lady of Gublu or Byblos). The town is called Gebal in the Bible; Ezek. xxvii. 9 mentions the maritime pursuits of the inhabitants. The remains of the town are rich in ruins, dating from Roman times and the period of the Crusades. It was the birth-place of Philo Byblius.

BYELINSKI, V. G. See **BELINSKY**.

BYELOSTOK, byá'łó-stók'. See **BIALYSTOK**.

BYERLAND. See **BEIJERLAND**.

BYERLY, WILLIAM ELWOOD (1849-). An American mathematician. He was born in Philadelphia, Pa., and in 1871 graduated at Harvard. He was assistant professor at Cornell (1873-76) and since then has been at Harvard, first as assistant professor, and then, after 1881, as full professor of mathematics. He retired from active service in 1913. He published: *Elements of Differential Calculus* (1879); *Elements of Integral Calculus* (1881); *An Elementary Treatise on Fourier's Series and Spherical, Cylindrical, and Ellipsoidal Harmonics*; *Problems in Differential Calculus* (1895); *Harmonic Functions* (1906).

BYERLY TURK, THE. The sire of the Herod race-horse stock, ridden in the Irish Rebellion of 1689, by one Captain Byerly and named after him. He was one of the triad from which all English thoroughbreds mentioned in the stud-book are traced. See **GODOLPHIN BARR**.

BYERS, SIR JOHN WILLIAM. An English gynecologist, born in Shanghai, China. He was educated at Queen's College, Belfast, at Dublin, at London, and at the Queen's University of Ireland. Beginning practice in 1879 in the Children's Hospital, Belfast, in 1882 he organized the department for diseases of women at the Royal Victoria Hospital. Later he became professor of midwifery and of diseases of women and children in the Queen's University of Belfast. His publications include *Address on Obstetric Medicine* (1909) and *The Evolution of Obstetric Medicine* (1912).

BYESVILLE. A village in Guernsey Co., Ohio, 95 miles east of Columbus, on the Pennsylvania Railroad (Map: Ohio, G 6). It has a glass factory, a tile and brick plant, and a gas-engine factory. The mining of the large deposits of bituminous coal in the vicinity is the chief industry. Pop., 1890, 789; 1900, 1267; 1910, 3156.

BYFORD, WILLIAM HEATH (1817-90). An American physician. He was born in Eaton, Ohio, graduated at the Ohio Medical College in 1844, and became professor of anatomy in the Evansville (Ind.) Medical College in 1850. In 1857 he was appointed professor of obstetrics and diseases of women and children in the Rush Medical College (Chicago), where he became

professor of gynecology in 1880. He was president and professor of clinical surgery in the Women's Hospital Medical College from its organization in 1862 until 1880, was twice president of the American Medical Association, and was president of the American Gynecological Society. Among his works are: *Practice of Medicine and Surgery Applied to Diseases and Accidents Peculiar to Women* (1865, 4th ed., 1888); *Philosophy of Domestic Life* (1868); *A Treatise on the Theory and Practice of Obstetrics* (1870; 2d. ed., 1873).

BYINGTON, EZRA HOYT (1828-1901). An American Congregational scholar. He was born at Hinesburgh, Vt., Sept. 3, 1828; graduated at the University of Vermont, 1852, and at Andover Theological Seminary, 1857; was pastor in various places. He wrote *The Puritan in England and New England* (Boston, 1896; 4th ed., 1900); *The Puritan as Colonist and Reformer* (1899); also the histories of the Congregational churches at Hinesburgh, Windsor, and New Haven, Vt.; a memorial of Rev. E. Cutler, D.D., and a volume of sermons, *The Christ of Yesterday, To-Day, and Forever* (1897). He died at Newton, Mass., May 16, 1901.

BY-LAW (probably on the analogy of *by-path*, *by-way*, corrupted from *byrlaw*; see **BYRLAW**). As the term itself indicates, it was first applied to the local rules or laws of a township, manor, or vill, but, as used at present, the term includes all rules or regulations made by public or private corporations, or even by unincorporated societies, for their own management or for the government of their members. The power to make and to change its by-laws belongs to every corporation, even without an express grant of authority. When the power is conferred by charter or by a general statute upon particular persons, such as a board of directors, it can be validly exercised only by such persons. In the absence of any limitation, however, the power belongs to the members at large. A by-law which is repugnant to a constitutional provision or to a settled rule of law, or which is unreasonable, is invalid. A valid by-law of a municipal corporation (or ordinance, as it is usually called in this country) is a true law, for it has the authority of the state behind it. By-laws of private corporations or of unincorporated societies are rather agreements binding on the members than laws in the true sense of that term. See **CORPORATION**, and consult the authorities referred to under that article; also Boisot, *By-Laws of Private Corporations* (2d ed., St. Paul, 1902); Pollock and Maitland, *History of English Law* (2d ed., Boston, 1898).

BYLES, BILZ, MATHER (1706-88). A New England clergyman and poet, distinguished for wit and repartee. He was born in Boston, March 26, 1706, graduated at Harvard in 1725, and after being ordained to the ministry, received charge, Dec. 20, 1733, of the Hollis Street Congregational Church, Boston. He was distinguished as a pulpit orator, and his published sermons show a considerable command of language. He corresponded with Pope and Swift and wrote a *Poem on the Death of George I* (1727); a *Poetical Epistle to Governor Belcher on the Death of his Lady* (1736); and *Miscellaneous Poems* (1744), which were lauded by his contemporaries to an extent that now seems ludicrous. Byles was a consistent Tory and in 1776 left his parish on that account. In 1777 he was denounced as an enemy of his country, tried,

and condemned to imprisonment and banishment, but he was suffered to remain in his own house, "guarded, regarded, and disregarded," as he said, and lived in Boston till his death (July 5, 1788), bequeathing his Royalist sympathies to his daughters. His son, Mather (1736-1814), also a clergyman, became an Episcopalian in 1768, and on the founding of St. John, New Brunswick, by the Tories, who had been expelled from Boston, became their rector till his death (1814).

BYLINA, bi-lě'ná (Russ., the past, from *byti*, Skt. *bhū*, to be, as it is historical in character). The epic songs of Russia, covering a period from mythological to comparatively modern times. Their heroes, *bogatyri* (paladins), are either mythical personages, personifications of the forces of nature, or historical characters. The former, the so-called "elder paladins," occupy a small part of the epic songs, the bulk of them dealing with the latter, or "younger paladins." In the cycle of "younger paladins," aside from the minor portion dealing with the later Moscow period, two main earlier subdivisions are distinguished; one clustering around the southern capital, Kiev, and its Prince Vladimir, the other around the free city of Novgorod. The central figure in the Kiev period is Ilya Muromets (q.v.). The *bylinas* have been collected from bards in the northern part of Russia and in Siberia, particularly in the governments of Olonetz, Arkhangelsk, and Toms. Consult: Rambaud, *La Russie épique* (Paris, 1876); Weselofsky, "Beiträge zur Erklärung des russischen Heldenepos," *Archiv für slavische Philologie*, vol. iii (Berlin, 1879); *Epic Songs of Russia*, translated by Isabel Hapgood (New York, 1886).

BYLLYNGE, bil'ling, EDWARD (?-1687). An English Colonial proprietor. With John Fenwicke, he purchased in New Jersey an extensive tract of land, including that part of the province north of an imaginary line drawn from Burlington to Barnegat. A quarrel regarding the division of the land having somehow arisen between these Quaker associates, William Penn, as arbiter, adjudged nine-tenths of the total property to be Byllynge's. Byllynge, however, soon made an assignment in favor of his creditors, and his holding, long styled the "Byllynge tenths," was disposed of to two organizations of the Society of Friends. In 1677 he was elected Governor of West Jersey Province, which he ruled through deputies and never visited in person. He was always out of harmony with his people, and his removal from office was being sought at the time of his death. Consult Tanner, *The Province of New Jersey, 1664-1738* (New York, 1908); Myers, *Narratives of Early Pennsylvania, West New Jersey, and Delaware, 1630-1707* (New York, 1912).

BYLNEY. See **BILNEY**.

BYNG, bing, GEORGE VISCOUNT TORRINGTON (1663-1733). A British admiral, born at Wrotham, Kent, Jan. 27, 1663. He entered the navy at the age of 15, and was rapidly promoted both in that arm and the army, in which he also held a commission until 1690. In 1688 he gained the favor of the Prince of Orange by activity and zeal in his cause and received the rank of captain. In 1703 he was made rear admiral of the red. The attack on Gibraltar was confined to his command, and for gallant conduct at Malaga he was knighted by Queen Anne. In 1706 he was elected to Parliament

and represented Plymouth until 1721. In 1708 he became admiral of the blue, and commanded a squadron fitted out to oppose the Pretender's intended invasion of Scotland from France. He pursued the French fleet to the Firth of Forth, took one ship, and forced the fleet back to Dunkirk, on which occasion he was presented with the freedom of Edinburgh. On the breaking out of the Rebellion of 1715 he was appointed commander of a squadron in the Downs and for important services against the French was created a baronet. In 1718 he commanded the English fleet sent to Sicily for the protection of the neutrality of Italy and gained a striking victory over the Spanish fleet off Messina. Soon after he was appointed treasurer of the navy and rear admiral of Great Britain. In January, 1721, he became a Privy Councillor and in September following was created Baron Southill and Viscount Torrington. On the revival of the Order of the Bath, in 1725, he was installed one of the knights, and on the accession of George II was nominated First Lord of the Admiralty. He held this office till his death, Jan. 17, 1733.

BYNG, JOHN (1704-57). A brave but ill-fated British admiral, fourth son of Admiral George Byng, Viscount Torrington. He entered the navy early, in 1727 became captain, and by 1748 attained the rank of admiral of the red. In 1756 he was promoted admiral of the blue, and appointed to command a hastily equipped squadron of 10 ships, sent to the relief of Minorca, at that time blockaded by a French fleet under La Galissonnière. On the 20th of May Byng gave the signal to engage, which was obeyed by Rear Admiral West, but Byng, through ill manoeuvring, failed to support him, and the French, acting on the defensive, remained victors. Byng did not consider himself justified in making other efforts and left Minorca to its fate. The dissatisfaction in England, when the news arrived, was taken advantage of by the ministry to divert public odium from their inefficient measures. Byng was tried by court-martial and condemned to death, for a breach of the Twelfth Article of War, but recommended to mercy. He was shot on board the *Monarch*, at Portsmouth, March 14, 1757, meeting his fate with firmness and resignation. A warm and somewhat indecisive historical controversy has arisen as to his actual guilt.

BYNG, J. H. G., LORD. See VOLUME XXIV.

BYNKERSHOEK, bin'kërs-höök, CORNELIUS VAN (1673-1743). A Dutch jurist, born at Middleburg, in Zeeland, May 29, 1673. He studied at the University of Franeker, took the degree of doctor in 1694, and immediately after commenced to practice as an advocate at The Hague. In 1703 he was elected by the States-General a member of the Supreme Council of Holland, Zeeland, and West Friesland and, in the exercise of his functions, soon had occasion to observe how defective was the common law of the country. With a view to remedy this, he published various works on the Roman, or civil law, the most important of which was the *Observationes Juris Romani*. In 1724 he was elevated to the dignity of president of the Supreme Council. His works on international law acquired wide celebrity. The most famous are *De Dominio Maris* (1703) and *Quæstiones Juris Publici* (1737). In addition to these, he made a digest, under the title of *Corpus Juris Hollandici et Zelandici*, of all the laws of his own country. His complete works were published at Geneva in 1761.

BYR, bŭr, ROBERT. See BAYER, KARL ROBERT EMMERICH.

BYRD, WILLIAM. See BIRDE.

BYRD, bērd, WILLIAM (1674-1744). An American author, son of Col. William Byrd, a Colonial official. He was born at Westover, Va., educated in England for the law and, on his return to his Colonial estates, became a man of great influence in the Colony. He was a member of the King's Council for 37 years and finally its president. He lived in lordly state at his plantation, Westover, and gathered the most valuable library in the Colony, numbering about 4000 volumes. He was the founder of Richmond (1733), also one of the commissioners on the North Carolina boundary, and did much to encourage immigration. He was a patron of art and science, and a fellow of the Royal Society of Great Britain. Byrd is best remembered as the author of the *Westover Manuscripts*, published in 1841 under three titles, *The History of the Dividing Line, A Journey to the Land of Eden*, and *A Progress to the Mines*, all remarkable for their style, wit, keen observation, and intrinsic interest. The best edition of these is that of J. S. Bassett (1901). Byrd's interesting letters have been published in *The Virginia Magazine of History and Biography* (1902). Consult Trent, *English Culture in Virginia* (1889); *A History of American Literature* (New York, 1903).

BYRGIUS, bër'jī-ūs, JUSTUS, or JOOST BÜRGI (1552-1632). A Swiss mathematician and inventor of various astronomical instruments. He was born at Lichtensteig, Canton of St. Gall. He was for many years employed as a mechanician in the service of Wilhelm IV, Landgrave of Hesse, and in 1603 entered that of the Emperor Rudolph II. Among his inventions may be noticed the proportional compasses. He also found a method of resolving spherical triangles and is said to have hit upon the idea of logarithms. Consult Gieswald, *Justus Byrg als Mathematiker* (Dantzig, 1856).

BYRLAW, bër'lā (Icel. *byr*, AS. *by*, Eng. *by*, settlement + *log*, Eng. *law*). In early English and Scottish history, the local custom or law of a township, village, or rural district. This law appears to have been administered by popular local tribunals, having no connection with the regular courts of the kingdom, and to have been concerned, for the most part, with disputes as to boundaries, trespass of cattle, etc. It prevailed extensively in England, especially in Kent, as late as the thirteenth century, but has now almost everywhere yielded to the common law and the regular tribunals.

BYRNE, bër'n, THOMAS SEBASTIAN (1841-). An American Roman Catholic divine, born in Hamilton, Ohio. He received his education at the public schools, the Preparatory Seminary of St. Thomas, Bardstown, Ky., and St. Mary's College of the West, where he graduated in 1865. After a supplementary course at the American College, Rome, he was ordained priest in Cincinnati (1869) and became instructor at Mount St. Mary's Seminary. He was subsequently placed in charge of the Cincinnati Cathedral, and upon the reopening of St. Mary's Seminary he became rector of that institution. In 1894 he was appointed Bishop of Nashville. In collaboration with the Rev. Dr. Pabisch, he translated Dr. Alzog's *Church History* (3 vols., 1874-78). His other publications include *Man from a Catholic Point of View*, which was read

in 1903 at the Parliament of Religions in Chicago.

BYRNES, THOMAS (1842-1910). An American detective, born in New York City. He served in the Civil War with the Ellsworth Zouaves until 1863, when he joined the New York police force. Rising rapidly because of his remarkable detective ability, he became superintendent in 1892 and chief of police in 1895. During his period of command the famous "dead line" (Fulton Street), south of which criminals were prohibited from going, was established. Although he brought the police to a high state of efficiency, the investigations of the Lexow Committee revealed great corruption among the high officials of the system, not involving Byrnes, however. For much of the 32 years that he was in the service of the police department, he was probably the most widely known detective of his day. A book which he wrote giving the biographies of the best-known criminals of the world remains the standard work of its kind.

BYRNIE, bērnī (AS. *byrne*, corselet, OHG. *brunna*, Olcel, *brynja*, breastplate; cf. OIr. *bruinne*, breast). A shirt of mail. In the time of the Carolingians it reached only to the hips, but in the tenth century it extended to the knees. The sleeves were made wide and short, affording no protection to the forearm.

BYRON, ANNE ISABELLA MILBANKE (1792-1860). The wife of Lord Byron and the only child of Sir Ralph Milbanke. She was born May 17, 1792; married Lord Byron Jan. 2, 1815, and separated from him in February of the next year. On the death of Lord (properly Baron) Scarsdale, she became Baroness Wentworth and for several years before her death employed her large income in works of charity. She died May 16, 1860. One child was borne by her to Byron, "Ada, sole daughter of my house and heart," who married William, Lord King, afterward Earl of Lovelace. Consult Harriet Beecher Stowe, *Lady Byron Vindicated* (Boston, 1869). See **BYRON, GEORGE GORDON**.

BYRON, GEORGE GORDON, SIXTH LORD (1788-1824). One of the greatest of English poets. He was born in London, Jan. 22, 1788, and was the only son of Capt. John Byron, of the Guards, and Catherine Gordon of Gight, a Scottish heiress. Captain Byron and his wife did not live happily. The husband was a profligate, and the wife's fortune was soon squandered at the gaming table. Separated from her husband, she retired, on an income of £150 a year, to Aberdeen with her lame boy, whom in her capriciousness she treated with alternate violence and affection. In his eleventh year Byron succeeded his granduncle, William, Lord Byron, and mother and son immediately left the north for Newstead Abbey, the ancient seat of the family, a few miles distant from Nottingham, in the romantic district of Sherwood Forest. On succeeding to the title, Byron was sent to Dulwich College, and thereafter to Harrow (1801). The most remarkable thing about his early years was his extraordinary attachments. In his ninth year, in Aberdeenshire, he fell in love with Mary Duff. His cousin, Margaret Parker, who died early, was his next idol. His strongest passion, however, was for Mary Chaworth, whom he first met when on a visit to Newstead in 1803. Miss Chaworth's father had been killed in a duel by Lord Byron, the granduncle of the poet, and marriage would have healed the family feud and

joined rich estates. But it was not to be. Miss Chaworth was Byron's senior by two years and evidently felt little flattered by the worship of the lame Harrow boy. Next year came the parting interview described in *The Dream*. In 1805 Byron entered Trinity College, Cambridge. The next year he had a Newark bookseller print for him a volume of his verse, the entire impression of which he was induced to destroy. With additions and omissions, the volume was republished in 1807. Later in the same year Byron made his first real appearance before the public in *Hours of Idleness*. The poems contained in this volume were not absolutely without merit; but they might have been written by any well-educated boy who, in addition to ordinary cleverness, possessed the slightest touch of poetic sensibility. The volume was fiercely assailed by Brougham in the *Edinburgh Review*, and his sarcasms stung Byron into becoming a poet. Byron attributed the attack to Jeffrey. The satire *English Bards and Scotch Reviewers* was written in reply to the article in the *Edinburgh Review*, and the town was taken by a play of wit and mastery of versification unequalled since the days of Pope. Byron now withdrew from England, visiting Portugal, Spain, Turkey, and Greece. On his return he published the first two cantos of *Childe Harold* (1812) with immense success, and was at once enrolled among the great poets of his country. During the next two years he produced *The Giaour*, *The Bride of Abydos*, *The Corsair*, and *Lara*. While these brilliant pieces were flowing from his pen, he was indulging in all the revelries and excesses of London society. What was noblest in the man revolted at this mode of life, and in an effort to escape from it he married, in 1815, Miss Milbanke, daughter of Sir Ralph Milbanke. This union was unfortunate. It lasted only a year, and during the brief period money embarrassments, recriminations, and all the miseries incidental to an ill-assorted marriage were of frequent occurrence. After the birth of her child, Ada, Lady Byron retired to her father's house and refused to return. Byron became the theme of all uncharitable tongues. The most popular poet, he was for a space the most unpopular individual in the country. In one of his letters, written from Italy some years later, referring to the slanders current at the time, he said: "I was accused of every monstrous vice of public rumor and private rancor. My name, which has been a knightly or a noble one since my fathers helped to conquer the kingdom for William the Norman, was tainted. I felt that if what was whispered and muttered and murmured was true, I was unfit for England; if false, England was unfit for me. I withdrew." The separation from his wife and the departure from England in 1816, never to return, mark a stage in the development of Byron's genius. A new element of power now entered into his verse.

Misery and indignation stimulated him to remarkable activity. Six months' stay at Geneva produced the third canto of *Childe Harold* and *The Prisoner of Chillon*. *Manfred* and *The Lament of Tasso* were written in 1817. The next year he was at Venice and finished *Childe Harold* there; and, in the gay and witty *Beppo*, made an experiment in the new field which he was afterward to work so successfully. During the next three years he produced the first five cantos of *Don Juan*, and a number of dramas of

various merit, *Cain* and *Werner* representing opposite poles. In 1821 he removed to Pisa and worked there at *Don Juan*, which, with the exception of *The Vision of Judgment*, occupied his pen almost up to the close of his life. In 1822 Byron, Shelley, and Leigh Hunt started a journal called *The Liberal*. After the tragic death of Shelley in the summer of this year Byron and Hunt quarreled, and the journal came to a quick close. Morally, Byron's Italian life was licentious, and his genius was tainted by his indulgences. The least censurable of all his moral lapses was his *liaison* with the Countess Guiccioli. Near the close of his career he was visited by a new inspiration; the sun so long obscured shone out gloriously at its setting. In the summer of 1823 he sailed for Cephalonia to aid the Greeks in their struggle for independence. From Cephalonia he went to Missolonghi at the beginning of January, 1824. There he found nothing but confusion and contending chiefs, but in three months he succeeded in evoking some kind of order out of the chaos. His health, however, began to fail. He died from exposure and fever, April 19, 1824. His body was conveyed to England, and, on the refusal of the dean to permit burial in Westminster Abbey, it was interred in the family vault in the village church of Hucknall, near Newstead Abbey.

Lord Byron is a remarkable instance of the fluctuations of literary fashion. Elevated to the highest pinnacle of fame by his contemporaries, he was unduly decried after his death, when the romance which he had thrown around himself and his writings began to wear away; and it is only during the last 20 or 30 years that the proper place has been found for him in the public estimation. The resources of his intellect were amazing. He gained his first reputation as a depicter of the gloomy and stormful passions. After he wrote *Beppo*, he was surprised to find that he was a humorist; when he reached Greece, he discovered an ability for military organization. When all the school-girls of England fancied their idol with a scowling brow and a curled lip, he was laughing in Italy and declaring himself to be the most unromantic being in the world. And he was right. Take away all his Oriental wrappings and you discover an honest Englishman, who, above all things, hates cant and humbug. In *Don Juan*, which is his masterpiece, and in his letters, there is a wonderful fund of wit, sarcasm, humor, and knowledge of man. Few men had a clearer eye for fact and reality. His eloquence, pathos, and despair, as in *Manfred* and *Childe Harold*, were only phases of his mind. Towards the close of his life he was working towards his real strength, and that lay in wit and the direct representation of human life.

Murray, Byron's original publisher, issued several editions of the complete works. Consult Henley, *Works of Lord Byron* (London, 1897-). The latest edition is that by Coleridge and Prothero (London, 1898-1901). The best (English) estimate of Byron is to be found in Matthew Arnold, *Essays in Criticism* (2d series, London, 1888); but consult G. Brandes, *Main Currents in Nineteenth Century Literature*, from the Danish (Eng. trans., New York, 1905); and a Russian estimate published in French, *Byron et le romantisme française*, by Vengsova (St. Petersburg, 1906). The main source of information as to his life is Moore, *Letters and Journals of Byron, with Notices of*

his Life (London, 1830; new ed., 1874). Consult also: Macaulay, *Moore's Life of Lord Byron* (London, 1831); Elze, *Lord Byron* (Eng. trans., ib., 1872); Jeaffreson, *The Real Lord Byron* (ib., 1883); Nichol, *Life*, in "English Men of Letters Series" (London, 1880); Countess Guiccioli, *Lord Byron jugé par les témoins de sa vie* (Paris, 1868); Eng. trans. by Jerningham as *My Recollections of Lord Byron and Those of Eye-witnesses of his Life* (Philadelphia, 1869); Lady Blessington, *Conversations with Lord Byron* (London, 1834); Trelawny, *Recollections of Shelley and Byron* (Boston, 1858); Hunt, *Lord Byron and his Contemporaries* (London, 1828). A very excellent account of Byron in the light of recent research is that of Ethel Mayne, *Byron* (2 vols., New York, 1912). See ROMANTICISM.

BYRON, HENRY JAMES (1834-84). An English playwright and actor, born in Manchester. He studied medicine and then law, but soon became an actor and a playwright, and will be remembered as the author of a number of successful plays, the earliest of which was *Fra Diavolo* (1858). *Our Boys* (1878) had a long run, but *Cyril's Success* (1868) is generally regarded as the best of his plays. Among his other works are: *Babes in the Wood* (1859), *War to the Knife* (1865), *A Hundred Thousand Pounds* (1866), and *An American Lady* (1874), all which display ingenuity rather than invention. He published one novel, *Paid in Full* (1865), was the first editor of *Fun*, and established a short-lived paper called *The Comic Times*.

BYRON, JOHN (1723-86). An English vice admiral and circumnavigator, the grandfather of Byron the poet. He accompanied Anson around the world, suffering shipwreck and enduring great hardships in Patagonia, and as commander of a fleet he circumnavigated the globe in 1764-66. In 1769 he was Governor of Newfoundland and in 1776 became vice admiral. In 1778 he was sent with a fleet to watch the movements of Count d'Estaing, who had gone to the assistance of the United States in their war against England; and in July of the next year he fought the Count of Grenada, but the action was of little importance. In 1768 he published an account of his shipwreck on the coast of Patagonia. It furnished some hints to the author of *Don Juan*, who refers to "my granddad's narrative."

BYRON BAY. An open bay, about 50 miles wide, on the east coast of Labrador, North America, in lat 55° N., long 58° W. (Map: Canada, T 6).

BYRON ISLAND. See GILBERT ISLANDS.

BYSOLITE. A fibrous, matted, feltlike variety of the mineral amphibole (q.v.).

BYSTRÖM, by'strēm, JOHAN NIKLAS (1783-1848). A Swedish sculptor. He was born, Dec. 18, 1783, at Filipstad, in the Province of Wermeland, and educated under Sergell of Stockholm. In 1809 he obtained the highest prize in the Swedish Academy of Arts, and in the following year went to Rome, where he executed his first independent work, a "Bacchante" (University of Upsala). In 1815 he returned to Stockholm and surprised the newly elected Crown Prince (Bernadotte) by exhibiting a colossal statue of himself, which he had finished all but the head in Rome and had found means to complete quietly in Stockholm. The Crown Prince was highly gratified and commissioned Byström to

execute colossal statues of Charles X, XI, and XII. After 1838 he resided in Stockholm, but returned to Rome in 1844, and died there March 13, 1848. His chief works are: "A Nymph Going into the Bath," a "Reclining Juno Suckling the Young Hercules," Royal Palace, Stockholm; "Hygieia," "Pandora Combing her Hair," marble statues of "Hero" and "Innocence" in the National Museum, Stockholm; a polychrome marble statue of "Victory" in the palace at Charlottenburg; a statue of Linnaeus, and colossal statues of Charles XIII, Gustavus Adolphus, and Charles XIV. Byström excels in the delineation of females and children, but his male figures are not strongly characterized; his grouping is skillful, but he lacks originality.

BYWATER, INGRAM (1840-). An English classical scholar, born in London, June 27, 1840. He received the degree of M.A. at Queen's College, Oxford, 1863, and was tutor and from 1883 university reader in Greek. In 1893 he succeeded Professor Jowett as regius professor of Greek. His work has been chiefly in the field of Greek philosophy. He is the editor of *Fragments of Heraclitus* (1877); *Priscianus Lydus* (1886); Aristotle, *Nicomachean Ethics* (1890). He wrote also *Contributions to the Textual Criticism of the Nicomachean Ethics* (1892), and in 1909 brought out *Aristotle on the Art of Poetry*, a definitive edition of Aristotle's *Poetics*, a revised text with critical introduction, translation, and an exhaustive commentary.

BYZANT, biz'ant. See BESANT.

BYZANTINE ART. Broadly speaking, the art that flourished throughout the Byzantine Empire, from the time when Constantine the Great made Constantinople (Byzantium) his capital, 330 A.D., to the capture of the city by the Turks in 1453. The term may be applied to Christian art of the Oriental and Hellenic peoples, as soon as it began to differ from the style of early Christian art, which both East and West had largely in common at the beginning. Its historic development falls into six periods: 1. The *Formative Age*, fourth to fifth century, in which experiments were tried and various forms of architecture and painting put to the service of religion, but no fixed formulas were found. Egypt, Syria, Asia Minor, North Africa, Greece, all erected monuments that differed very much from the official type of Roman Christian basilica; and it was the Hellenic painters who then depicted, both in manuscripts and on church walls, the first portraits of Christ and the earliest systematic series of Bible illustrations. 2. The *Golden Age* of Justinian, which began about 500 A.D., and established the true norms of classic Byzantine art. These were, in architecture, the use of the dome on pendentives, with other forms of vaulting in subordination; the decoration of surfaces, mainly by deeply colored mosaics and rich marble facings, without the light and shade of heavy architectural projections or relief ornaments. The standard set by Hagia Sophia was never afterward equalled. The centre of official art was at Constantinople, and the clergy gradually assumed its control. This school declined during the seventh century. 3. The *Iconoclastic Age*, lasting substantially throughout the eighth century, while it seemed to give a deathblow to certain forms of religious art, really led to a healthy reform. It temporarily killed religious painting, from an exaggerated fear of the idolatrous tendency of

painted images of sacred personages, but developed decorative and floral design, and its renovation of social and political life reacted healthily on art, preparing the way for (4) the *Macedonian Revival* of the ninth and tenth centuries. The sturdy rulers of the Macedonian dynasty counteracted the morbid and unhealthy tendencies of Byzantine art and fostered the return to classic models. The reigns of Basil the Macedonian, Constantine, and Nicephorus Phocas saw a second Golden Age of superb monuments. The Imperial palaces were as magnificent as the palaces of the Cæsars in old Rome, and the industrial arts reached an unequalled perfection. (5) The *Age of the Comneni*, during the eleventh and twelfth centuries, at its beginning was as splendid as the preceding. A great new school of art was established at Mount Athos. This monastic school spread its influence far and wide. Many cities and monasteries became special art centres, no longer dependent on Constantinople. Thessalonica continued its traditions. It was now that Europe, through the Crusades, through the trade with Venice, Pisa, Genoa, and other Italian cities, and through the Greeks in Sicily and south Italy, came to feel most intensely the influence of Byzantine art, by which the barbarism of European nations was modified and their newly awakened artistic instincts directed. (6) The *Age of the Paleologi*, from the thirteenth to the fifteenth century, is that of decadence. The decline was hastened by the barbarous conquest of Constantinople and the Empire by the Crusaders in 1204. The stream of fruitful art was dried up and the works of this age, which helped to influence Italy in the revival of painting, were unworthy of this high office and have helped to give the mistaken idea of Byzantine painting generally current. The churches at Trebizond show the decline in architectural grandeur and decorative ability.

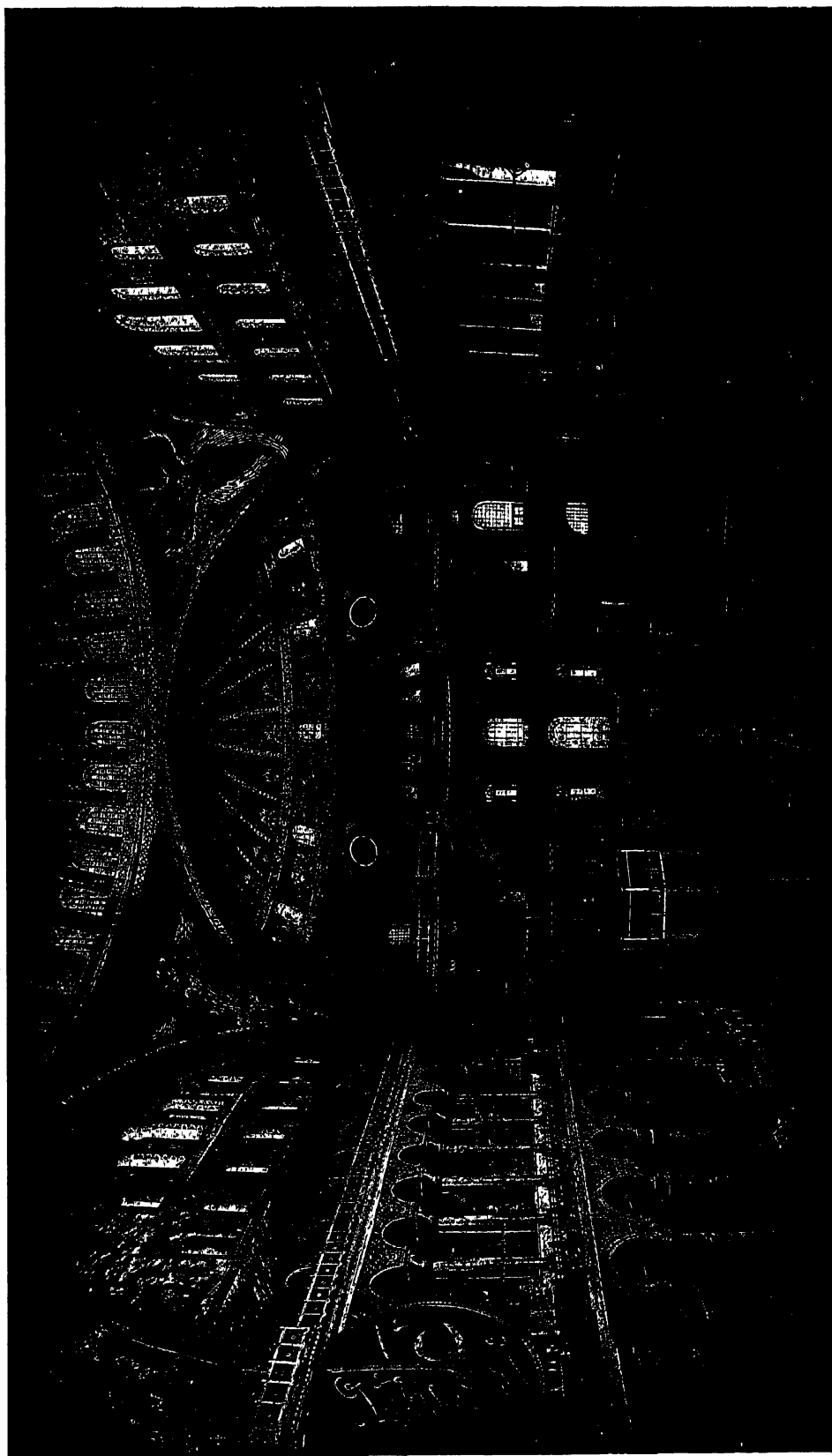
Byzantine art was a composite picture, for it had come into a varied inheritance. It derived intense love of color from the Orient, power to idealize from the Greeks, ability in architectural composition from the Romans. The recent researches of Strzygowski have shown that Byzantine art is an essentially Hellenistic development, radiating from Asia Minor, rather than a Roman. Its use as an impressive part of the pomp of Imperial power in palace, processions, and ceremonials was thoroughly Oriental. Its exquisite treatment of every detail was thoroughly Hellenic; its development of interior effects was thoroughly Roman; but it utilized these various elements in the service of a perfectly original scheme. Its most important additions to the general fund of the art assets of the world were: the dome on pendentives, which made it possible to erect a dome of any size upon four or more isolated supports and by this means to cover with domes any kind of a ground plan, thus securing superb interiors; figured mosaic wall paintings, the most permanent and magnificent surface decoration for architecture; a system of Christian iconography, corresponding to the system of classical mythology and embodying in art the same ideas that were expressed in creeds, dogmas, proceedings of the councils, and writings of the Fathers, and so serving as an important vehicle of religious instruction; the preservation of classic traditions, which would otherwise have been broken, and the imparting of them in modified form to

the Mohammedans and Europeans of the Middle Ages; the development of the minor arts to a higher pitch of perfection than ever before, giving models to all branches of art elsewhere.

When Byzantium was transformed into Constantinople by Constantine, the enlargement of the old city was made by the work of a large number of artists and artisans imported by Constantine from all parts of the Empire, but especially from Rome. A second pillaging of the artistic treasures of the ancient world took place for its benefit. Its forums, basilicas, baths, theatres, circus, were filled with works of Greek sculpture. While even then there was undoubtedly a considerable Hellenic element, the transformation of Christianity from a Roman to a Byzantine cult was gradual during the fifth century and is symbolized by comparing the basilica of St. John (c.450), still in the Latin style, slightly modified, with the "little St. Sophia," or church of SS. Sergius and Bacchus, in which, c.525, the elements of the Byzantine style were largely embodied. Probably these elements had been first worked out in more purely Hellenic soil and then brought into Constantinople; as, for instance, was the case with the scheme of Hagia Sophia, brought in by architects from Asia Minor. The various stages in the school of Constantinople before and after the time of Justinian are illustrated by the many magnificent cisterns with their forests of columns (fourth to the tenth century), the scanty remains of some of the old palaces (Boukoleon) and monasteries, the churches of St. John (fifth), SS. Sergius and Bacchus (sixth), St. Irene (eighth), Theotokos (tenth), Mone-tes-Choras (eleventh to the thirteenth), Pantokrator (twelfth). It is this central school which developed mosaic painting, a form of decoration that is seldom found in Asia Minor, Syria, Palestine, Egypt, or other parts of the Empire, although carried by Byzantine artists into Italy (Rome, Ravenna, and Venice). It is difficult to follow the geographical intricacies of Byzantine art, for to the division into schools are added the territorial fluctuations. The official and central school at Constantinople was followed more or less strictly throughout the Greek provinces, almost as closely in parts of Asia Minor, still less closely in Syria. Certain large territories which were wrested from the Empire by the Arabs in the seventh century were at that time beginning to feel the strength of the influence of Constantinople, though they had not yet lost their artistic independence. Such were the provinces of northern Africa and Egypt, of Mesopotamia, and part of Syria. The Coptic school in Egypt had some of its roots in ancient Egyptian art, but the churches of Old Cairo and the monasteries of the desert show that especially in decoration Byzantine art had obtained a strong foothold and that the Byzantine reminiscences found in the later Mohammedan art of Egypt are largely attributable to this source. Other regions of the East which remained unconquered by the Mohammedans mingled local traits with prevalent Byzantine characteristics. This was especially the case in Armenia, Georgia, and the neighboring regions of the Caucasus, where the central dome, or pendentive and high drum, and the Greek-cross plan govern nearly all churches from the seventh to the fifteenth century, as at Ani, Etchmiadzin, Dighur, and Pitzounda, while their surface decoration is peculiar and akin to what we know as

Celtic and Northern ornament. Of all Eastern churches, those of Asia Minor—such as those of Cassaba, Myra, and Nicea—are almost alone the exact echoes of the school of Constantinople, except for the productions of Greece itself and the present provinces of European Turkey. One of the most important functions of Byzantine art was its influence outside of its home sphere. It is quite certain that if, when the Northern tribes wiped out Roman culture in the West, Byzantine influence had not been actively exerted in Italy; if Ravenna and then Venice had not been preserved as Byzantine outposts, and Rome resuscitated by Byzantine monks and immigrants; if Greek colonies had not been thrown into southern Italy; if Sicily under the Normans had not subjected herself to Byzantine influence, and if the great maritime republics that held the trade of the world in their hands from the ninth to the thirteenth century—Amalfi, Venice, Pisa, Genoa—had not brought to the West all portable works of Byzantine art and themselves become impregnated with the artistic atmosphere of the East; and finally, if the Crusades had not opened up before the barbarous West superb vistas of the artistic civilizations of Byzantines and Mohammedans—if all this had not happened as it did, the torch of progress would not have been handed on, and the great Gothic and Renaissance eras would not have been what they were.

Architecture. Byzantine architecture is the complete monumental expression of Hellenic Christendom. The Greek church in most higher branches of culture imposed itself upon the Latins, but it began by accepting the Latin scheme of basilical architecture. After experimenting with it for a while (fourth to the fifth century), the Greek genius selected the Roman dome as its fundamental unit, in place of the wooden roof and groined vault, and by the use of lofty piers and pendentives (q.v.) was able in the sixth century to suspend the dome and use it with any kind of ground plan, even multiplying domes at will in the same interior. (See DOME.) It was in the abstract a higher form of architecture than either the Roman or the early Christian and was the real link between Rome and the Middle Ages, because it showed how the vaulting systems of Rome could be adapted to the form of the Christian church and, taking up the dome at the point to which the Roman architects had developed it, carried it a step farther and made possible all styles of architecture that have come, even after the Renaissance. The Romans had gone no farther in weakening the solid circular wall that supported their domes than to cut niches in it, as in the Pantheon; the early Christian architects had gone a step farther and turned the lower part of this wall into a colonnade, which opened into one or more concentric aisles, as in Santa Costanza. But the Byzantine architects of Asia Minor invented the pendentive, which made it unnecessary that the supports should follow the outline of the dome. The preliminary stages appear, it is true, in some Roman buildings of the third century, notably the octagonal domed chambers in the curved lateral buildings of the Baths of Caracalla (215 A.D.), and the so-called temple of Minerva Medica (267), with a buttressed dome on a decagonal substructure. A rude embryonic dome on a square plan covered the centre of the cruciform tomb of Galla Placidia at Ravenna (460). A more systematic



BYZANTINE ARCHITECTURE
INTERIOR OF THE CHURCH OF ST. SOPHIA, CONSTANTINOPLE

development of the pendentive appears in buildings like San Vitale at Ravenna, the cathedrals of Ezra and Bosra in Syria, and SS. Sergius and Bacchus at Constantinople, all built early in the sixth century. Then came the masterpiece, Hagia Sophia (q.v.) at Constantinople, built by Anthemius (q.v.) and Isidore, architects of Asia Minor, who here for the first time suspended a vast and lofty dome above an interior of complex plan, and by piercing its lower portion with a circuit of 40 windows and reinforcing it by external buttresses between them, prepared the way for the later development of the drum, to which, 1000 years later, Michelangelo was to give consummate expression in the drum and dome of St. Peter's. The two great semidomes flanking the central dome made possible an oblong plan without breaking the unity. The apse, side aisles, and galleries are all more thoroughly subordinated to the central nave than in any other Christian structure. (For details, see under HAGIA SOPHIA.) No other Byzantine church undertook to rival or imitate, even in plan, Hagia Sophia. The great variety in plan and elevation of Byzantine churches is in strong contrast to the uniformity of early Christian churches. Some are in the form of a Greek cross, like St. Mark's in Venice, with five domes; the commonest form is oblong; with each bay covered by a small dome. Usually there is a central dome, raised on a drum above the rest, and sometimes cross vaults or tunnel vaults take the place of minor domes. In course of time the churches became smaller, the domes were erected on higher drums, the closed porch or narthex became larger and was usually domed, the exteriors, instead of being of plain bricks, had alternate courses of brick and stone or marble, and were diversified by inset panels and patterns in relief as well as by pilasters and arcades. St. Irene and the Monétas Choras (Kahrié Jami) represent the middle and the Theotokos (or St. Theodore) and Pantokrator the final stage of this development at Constantinople. The churches of the Apostles, of St. Elias, and of the Virgin at Salonica are among the most exquisite of this class in proportions and details, with tower-like domes and effective exteriors. In Greece proper the city churches, like the cathedrals at Athens and Mistra, are very small, and are excelled in size and decoration by the monastic churches, such as those of the Basilians at Chios, Mount Helicon (St. Luke), Daphne, and Mount Athos, built between the tenth and fourteenth centuries. On a somewhat larger scale were the churches in the East. Syria, as shown by such churches as those of Damascus, Dana, Antioch, Edessa, held mainly to the basilical style up to the time of the Persian and Mohammedan invasions of the sixth and seventh centuries, which put an end to Christian architecture in that region; although the Golden church at Antioch and the church at Jerusalem which preceded the present (so-called) Mosque of Omar were probably both of domical design. But Asia Minor, the source of Byzantine domical construction, still shows many churches of this style, such as those at Myra, Ancyra, Cassaba, Ephesus, Nicæa; Armenia, Georgia, and the Caucasus adopted for a period a pure Byzantine style, while at other times they developed local peculiarities, such as stone construction, pitched roofs, polygonal domes, carved ornamentation, etc. Churches at Ani, Dighur, Pitzunda, Etchmiadzin, etc., show

how active this region was under its kings between the tenth and the fourteenth centuries. Near them was Trebizond, which shows churches belonging to the time in the thirteenth century when it was the Byzantine capital, while Constantinople was occupied by the Crusaders. Passing eastward, we find that the Byzantine style has penetrated into the northern provinces connected with the Empire of the East, into Servia and other Danubian provinces (as at Kurte d'Arjish, Studenitza, and Semendria), and into Russia (Hagia Sophia at Kiev), where Slavic taste degraded it gradually until the bulbous domes and exaggerated and overloaded details placed Russian Byzantine architecture upon a level with Mongol and Indian monuments.

Byzantine architecture existed even beyond the political limits of the Empire. Parts of Italy were pervaded by it between the sixth and twelfth centuries. Ravenna is a well-known example of the earliest period, with its San Vitale, its mausoleum of Galla Placidia, and its baptisteries. Venice also was an outpost of the East. St. Mark's was a reproduction of the Church of the Apostles at Constantinople, with its five domes on a Greek cross and with its superb series of mosaic and marble decorations. It is decoratively at least in its present condition a better representative of Byzantine art than Hagia Sophia. The earliest palaces of Venice also are thoroughly Byzantine, not only in style, but in plan, as, for instance, the Fondaco dei Turchi and many of smaller size. Santa Fosca at Torcello is also purely Byzantine. Farther south it is common to find Byzantine influence combined with Mohammedan. This is the case in Sicily—as in the Eremitani and San Cattalio at Palermo—and in Campania. But throughout Calabria the churches are as purely Byzantine as in Greece, and other examples are scattered elsewhere, as the cathedral at Capri and San Germano at Monte Cassino. Even Germany (Aix-la-Chapelle, Paderborn) and France (whole of Périgord, especially St. Front at Périgueux), were sporadically invaded. It was natural that the less civilized northern and eastern nations on the borders of the Byzantine dominion should receive its architecture. The monuments of the countries in the northern part of the Balkan Peninsula are of this class. Servia, Bosnia, Bulgaria, all borrowed from Byzantium, and it was the same even with the more powerful states.

The main classes of Byzantine architecture are: (1) churches; (2) monastic establishments; (3) palaces; (4) fortresses. So little remains of minor classes, such as private houses, hospitals, fountains, civil edifices, etc., that we can get only vague ideas as to their style. The Imperial palaces at Constantinople, described in contemporary accounts as gorgeous in their decoration, have left no appreciable remains except the single impressive ruin near the Golden Horn known as the Blachernæ Palace (Tekfour Seraf by the Turks), but identified by Van Millingen as the Palace of the Porphyrogenitus. This dates from the tenth century and displays externally an interesting use of patterns in brick and marble. The fortresses have frequently survived and serve to show that in Africa, Syria, and Asia Minor they served as models to the Mohammedans and subsequently to the Crusaders, thus revolutionizing the military architecture of Europe as well as the East. The monastic establishments are even more im-

portant for architectural history than the corresponding ones in the West (see MONASTIC ART), because Byzantium always remained subject to monastic art, whereas Europe was so only for a short time. There were of course certain great centres of monastic architecture, such as the Mount Athos monasteries, those of Thessaly (Meteora), the Stoudion near Constantinople, and St. Simeon Stylites in Syria; but the monastic influence was not concentrated, as in the West, in a few large establishments, nor did the monks, as there, shun the cities. There were few churches that had no monastery attached to them. Among good examples are the monastery of the eleventh century on the island of Chios, that of Daphne, and St. Luke on Mount Helicon in Greece, of the same period; but greatest of all are the groups upon Mount Athos. (See MONASTIC ART; ATHOS.) The Byzantine architects made but little use of concrete; building of brick, they were able to decrease the thickness of their walls. For their domes they used hollow conical bricks of very light clay, which fitted into each other. This gave a minimum of weight and a maximum of cohesion. Although they did not use any flying buttresses nor advertise their methods of construction as the Gothic architects did, they nevertheless invented a system of equilibrium through interacting thrusts and a concentration of thrusts upon given points, which, although not apparent, was none the less effective. In Hagia Sophia there is a pyramidal progression, the thrust of the dome being received on two sides by semidomes, on two others by immense buttresses, and then transmitted to the gallery vaults over side aisles and narthex, until it dies away in the low walls of the exterior. The distinction carefully observed in the interior design of this building between those supports which bear and resist the chief loads and thrusts and those which carry only moderate vertical weights shows the early recognition of a principle which became fundamental in the development of Gothic architecture seven centuries later. But the mathematical knowledge required to carry out the principle successfully on so large a scale was not to survive Anthemius very long. No subsequent attempts equal Hagia Sophia. The nearest approach, the palace church of Basil the Macedonian, has been destroyed. In the decoration of their interiors Byzantine architects loved color as much as did the Romans, and they carried it out more thoroughly than the early Christian architects of the basilical style, for their system was an incrustation of marbles and mosaics far richer than that used in the West, whose architects were often satisfied with thin-colored wall paintings. The entire system of Christian iconography was often given in mosaic pictures, and the lower walls covered with incrustations of veined marble, sometimes enriched with patterns of *opus sectile*. The pavements also were of mosaics. This applies particularly to the central and most strongly Hellenic parts of the Byzantine dominions and less so to frontier provinces, such as Syria, Egypt, and Asia Minor. The classic orders were almost wholly discarded; capitals, friezes, cornices, and plaques were decorated in low relief, basketwork (undercut and openwork), and Oriental patterns, often borrowed from stuffs, and heavy projections were avoided. Sculptural became more and more subordinated to color effects.

Sculpture. There are few works of Byzantine figured sculpture, on account of both the Oriental incapacity in drawing the figure after the Roman decadence and the iconoclastic prejudice against images. There are a few early works, such as the Ambone at Salonica, some sarcophagi at Ravenna, the wooden doors of Santa Sabina in Rome, which show how closely akin its style was during the fifth and sixth centuries to early Christian sculpture, with added imagination and Hellenic refinements. One of the latest echoes of this stage is the colossal bronze statue of a Byzantine Emperor from Barletta, now in Naples, the last of the Imperial statues. The stiffer late Byzantine methods which prevailed between the tenth and fifteenth centuries are shown in the Madonna of the cathedral at Ravenna, the reliefs of Christ and angels at the Eski-Juma Mosque in Constantinople, and a few reliefs at the Mount Athos monasteries. While of rare occurrence, works of sculpture never lapsed into the state of barbarism current in Europe from the seventh to the twelfth century, but always retained artistic qualities. Decorative sculpture especially was developed on principles of design more Oriental than classic; the stereotyped orders, anthemion, honeysuckle, egg-and-dart, and pearl motives, being superseded by a great variety of floral, geometric, and animal forms, sometimes free, sometimes schematic in arrangement. The technique also differed from that of classic ornament; the relief was usually slight, the surfaces rather flat, and the effectiveness secured by undercutting or sharp arrises, with violent rather than delicate transition of surfaces. This was carried to an extreme in the "basket" capitals and similar works, where the design is almost entirely cut away from the ground, and in the altar and choir screens, where the main outlines are cut through the slab. The churches of Ravenna, Parenzo, Venice, Constantinople, and Salonica are rich in such works of the central Byzantine school, while a corresponding but independent development appears in the numerous churches of central Syria, where the design is freer and less like an adaptation of patterns from stuffs applied to sculpture. Byzantine ornament prevailed throughout Italy (except Lombardy) until the eleventh century and lay at the basis of much of Mohammedan design in Egypt, Spain, and the East. It thus, more or less directly, permeated the Middle Ages. The minor branches of sculpture are described under *Minor Arts*.

Painting. The methods of fresco or wall painting, of mosaic, and of panel painting were all practiced by the Byzantine school. The less durable wall paintings and panels of the early period have disappeared throughout the East, and it is only from the mosaics that any idea of the history of Byzantine painting before the twelfth century can be gained. Its influence was even more universal than that of Byzantine architecture or sculpture, and dominated practically all schools of Christian art until the Renaissance. It was felt even in the later frescoes of the Roman catacombs. The destruction of examples in the East itself, first by the persecution of the Iconoclasts (see ICONOCLASM), then by the vandalism of the Mohammedans, has obliged historians to rely largely on examples preserved in the West. The earliest stage appears at Ravenna in the mosaics of the two baptisteries and especially in the mauso-

leum of Galla Placidia, an exquisite scheme of color and decoration typifying the classic stage of the fifth century. The second period (of Justinian) is shown in mosaics at Hagia Sophia in Constantinople and at Salonica, and especially in those of San Vitale and Sant' Apollinare Nuovo at Ravenna, in which the mosaics form substantially the entire scheme of internal decoration, both figured and ornamental, with scenes from both the Old and New Testaments. Ordinarily it was only in the apse, the dome, and the triumphal arch that so expensive a form of ornament was employed. There was a period of decadence during the seventh and eighth centuries, of which some examples remain in Ravenna (Sant' Apollinare in Classe) and Rome (Sant' Agnese and San Venanzio), though hardly anything remains of this time outside of Italy. During the revival under the Macedonian dynasty (ninth to the eleventh century) the cycle of subjects represented by Byzantine painting was enlarged and systematized into a complete iconographic cycle, which furnished themes and their method of treatment to later art in the West. The most superb single group of monuments in which the mosaicists showed their skill was the Imperial palace and chapel at Constantinople. To the close of this period belong the mosaics of Nicea, of St. Luke on Mount Helicon, of Chios (monastery of Basilians), of Daphne, and of Hagia Sophia at Kiev in Russia; while its earlier years may well be represented by the great series in Santa Prassede at Rome, in St. Irene at Constantinople, and St. George at Salonica. With the middle of the eleventh century, a new stage of activity opens for Byzantine painting. In reality its decadence has commenced, but the revival of art in Europe at that very time gives it a far broader scope beyond the now much-narrowed limits of the Eastern Empire. The Italian states, such as Venice (mosaics of Torcello, St. Mark's, and Murano) and the Norman Kingdom in the south (Cefalù, Martorana, and Capella Palatina at Palermo), employed Byzantine mosaicists, who trained local imitators. The Roman school was newly founded in this manner (Grottaferrata, Santa Maria in Trastevere); so was the great Benedictine school of Monte Cassino under Desiderius. These three centuries (eleventh to the thirteenth) furnish for the first time numerous extant frescoes, from the scattered examples in the Greek monastic chapels of Calabria to the large coördinated series in the monastic churches of Mount Athos and Campania (Sant' Angelo in Formis, Sessa, and San Niccolò near Monte Cassino). Besides these and other centres of Byzantine influence in Italy, the Russian, Bulgarian, Armenian, Georgian, and other schools of painting are founded on Byzantine models. The rules for painting, both as to technical method and treatment and arrangement of subjects, are embodied in manuals, such as that attributed to Panselinus and used for centuries by the painters of Macedonia and Mount Athos (Didron and Durand, *Manuel d'iconographie chrétienne*, translated from the Greek, Paris, 1845). These carefully detailed directions, written and arranged in the form of a book, were circulated everywhere, and while facilitating quick execution, called for little exertion of artistic imagination or taste, and hastened the decadence of true art in the Byzantine school. When Italian fresco painting, as well as mosaic painting, was revived in the thirteenth

century from one end to the other of the peninsula, the native artists went to the Byzantines to be taught. Such leaders as Giunta at Pisa, Margaritone at Arezzo, Guido and Duccio at Siena, Cimabue at Florence, Cavallini at Rome, adopted Byzantine methods wholly or in part. The fourteenth century witnessed the complete emancipation of the West, as well as the complete decadence of painting in the East. Such mosaics as those of Bethlehem (Church of the Nativity) and of the Kahrié Jami at Constantinople show the approaches of this decadence, which becomes plain in the mass of frescoes at Mount Athos and Meteora in Thessaly, at Mistra and Trebizond. Since then there has been nothing but lifeless repetition in the monuments of the Greek and Russian churches.

Minor Arts. The mediæval artists of the Byzantine Empire excelled in the arts of luxury, decoration, and industry; in the illuminating of manuscripts; the carving of ivory book covers, boxes, and diptychs; the weaving of tapestries, hangings, and rugs; the making of superb vestments for the priesthood and nobility; the carving of cameos and precious stones, glassware, and faience; the casting, embossing, chasing, and enameling of works in gold, silver, and bronze. Church treasures and palaces were equally filled with a multitude of such works. The description of the ceremonial of the Imperial palace by the Emperor Constantine Porphyrogenitus, the texts relating to Hagia Sophia, the report of the embassy of the Lombard Liutprand, and many other texts are confirmed by the surviving examples exported to the West. The superb collection of church vessels in the treasury of St. Mark's in Venice is mainly part of the loot of 1204 from St. Sophia. The Imperial dalmatica at St. Peter's in Rome is the most beautiful of Byzantine figured stuffs, which were among the most valuable exports from the East. The enameled reliquary at Limburg (948-59) and the crown of St. Stephen (1071-78) at Budapest also stand at the head of their class, being surpassed only by the famous Pala d' Oro (q.v.) at St. Mark's. That the artists of Constantinople often received orders from the West is shown by the bronze doors decorated with designs in *niello* executed for Italian churches in the eleventh century, such as those of Amalfi, Monte Cassino, Sant' Angelo, Atrani, and St. Paul's at Rome. The ivory carvings still extant are very numerous. The golden ages for their production were the fifth to the sixth and the tenth to the eleventh centuries, though perfection in this branch of art was more constant than in any other until the thirteenth century. Among the most beautiful early pieces are the Monza diptych of Galla Placidia (c.440), the Archangel of the British Museum, the Brescia box, and especially the marvelous episcopal ivory throne at Ravenna. Of later works, some of the finest are the "Virgin and Child," the "Crucifixion" triptych and the "Coronation of Romanus and Eudoxia" in Paris. One especially interesting class is that of the ivory oblong boxes, the only large series that are not religious in character, carved with lifelike scenes of daily life or borrowed from classic legend and myth—a peculiar survival. These can be seen at Sens, Cortona, Florence (Carrand), St. Petersburg, New York (Metropolitan Museum), London (South Kensington), and in nearly all large collections of mediæval ivories.

Surpassing even the ivories, both in their importance for the history of art and in remaining examples, are the Greek illuminated manuscripts. It was in the East that the first works of this sort were executed. The idea of making pictures of all the main events of the Old and New Testaments in chronological series, starting in this way, passed into the field of monumental painting in the fifth century and was most fruitful in results. The gold ground, the brilliant coloring, the idealistic qualities, and the opposition to realism of this branch of art made it peculiarly suitable as an expression of the Byzantine spirit. It followed the same historic vicissitudes as ivory carving. The Rossano Gospels, the Vienna and London Genesis, the Vatican roll of Joshua and Topography of Cosmas, the Syriac manuscript at Florence are the leading early works (fifth to the sixth century). For the middle period, with its peculiar combination of asceticism and classic revival, the typical works are the Homilies of Gregory Nazianzen and the Psalter in Paris (Bibliothèque Nationale), and the later Menologium of Basil at the Vatican (ninth or tenth century). A certain number of manuscripts executed by Imperial command are especially magnificent, such as St. John Chrysostom for Nicephorus Botaniates (1078-81) at Paris, the Panoply for Alexis Comnenus (1081-1118), and the Evangelarium for John Comnenus (1118-43) at the Vatican. The decoration has become extremely rich at this time and the figures reduced in size or surrounded by heavy borders. Classic traditions no longer obtain, and asceticism dominates. The connection with monumental painting during all these centuries has remained very close, and as there is an unbroken series of examples, in contrast to the scarcity and breaks in larger works of mosaic and wall painting, the miniatures supply invaluable material for the history of medieval painting. In this branch only does the East preserve many examples, in the libraries of many monasteries, such as those of Mount Sinai, Mount Athos, and many more throughout the Levant. Still it is in Western collections, such as the Vatican, Bibliothèque Nationale, and British Museum libraries, that the bulk has found refuge. Being a common object of commerce, these manuscripts, imported into Italy, Germany, and France, furnished local sculptors, painters, and decorators with models and motives in nearly every branch of art during all the centuries before the Renaissance. Finally, there are a few other categories which may be mentioned, though of lesser importance. There were little portable mosaic tablets, such as the diptychs in the Opera del Duomo in Florence and the Transfiguration in the Louvre, of marvelous delicacy of execution. The panel pictures, which were of considerable size in Italy, appear to have been smaller in the Byzantine school. The remaining examples are mostly later than the twelfth century. There are interesting collections at the Vatican, at Ravenna, and at Palermo. Earlier panel pictures are some of the so-called miraculous paintings of the "Virgin and Child," some supposed to be painted without hands. A number are in Rome (e.g., Santi Domenico e Sisto and Santa Maria Maggiore), Venice (St. Mark's), Bologna (Santo Stefano), and throughout Italy. Crete was the centre for a school of panel painting, one of its leaders being Rico, which influenced the Italian schools in the thirteenth century. In Venice

itself was established, in the eleventh century, a school of Byzantine painters. In the vexed question of Byzantine influence over European art, there is one point where no reasonable doubt can exist: that in all these minor arts the far more advanced culture of the East furnished the standards, not only for technique and artistic form, but for treatment of theme. The silk and tapestry workers of Sicily, Venice, Rome, and Flanders, the gold, silver, and enamel workers of the Rhine, the mosaicists of Campania and Venice, the panel painters of Tuscany, the ivory carvers and goldsmiths of the monasteries everywhere, learned their art from Byzantium. See GLASS.

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BYZANTINE EMPIRE, also styled the East Roman, Eastern, Greek, or Later Roman Empire. On the death of Theodosius (q.v.), in 395, the Roman Empire was divided between

his two sons, Arcadius, who had the eastern half, with his capital at Constantinople, and Honorius, who had the western half. This event is generally taken for the beginning of the so-called Byzantium Empire, which took its name from Byzantium (q.v.), the ancient name for its capital. It came to an end in 1453, when Constantinople was captured by the Turks.

Arcadius (395-408) was weak and wholly under the domination of his successive ministers, Rufinus, Eutropius, and Gainas, of whom the first and the last were Germans; Gainas, who had murdered Rufinus, was succeeded in power by the Empress Eudoxia. Only after her death, in 404, was Arcadius at all independent. He was succeeded by his son Theodosius II, a boy of seven, who ruled from 408 to 450. During his whole reign the government was ably carried on by his sister Pulcheria, who was noted for her rigid virtue. During his reign the Huns under Attila exacted repeated contributions of money and gifts. Attila's demands ceased as soon as they met with a firm refusal from Marcianus (450-457), whom Pulcheria married after the death of Theodosius. Leo the Thracian (457-474) was elevated to the throne by the German general Aspar, who was all-powerful until he was murdered by the Emperor in 471. Zeno (474-491), son-in-law of Leo, succeeded, although the latter's son Leo II, a boy of four, was at first proclaimed Emperor. After the death of Zeno his widow married Anastasius I (491-518), who obtained the Empire through her favor. Justin (518-527) was an Illyrian peasant, of Slav descent; as a soldier of fortune he had risen rapidly. He put an end to the religious troubles which had existed under his predecessors. Leo, Zeno, Anastasius, and Justin were all men of experience, who pursued a cautious policy, recruited an army of natives, made administrative and financial reforms, and left the treasury full, the army strong, and the Empire intact. But for their labors the reign of Justinian the Great (527-565) would have been impossible. By his conquests and able administration he raised the Empire to a higher degree of prosperity and power than it was ever again to experience. His entire policy was directed towards unity, and this formed the keynote for the future history of the Byzantine Empire. He sought to bring all under one state, one church, and one law. The Roman law was compiled and published under his auspices in the form of a monumental code. After his death the Empire declined rapidly. His great enterprises had exhausted the treasury and necessitated heavy taxation. His successor, Justin II (565-578), without his ability, aspired to greater glory. The Persian War, which he provoked needlessly, drained the resources of the Empire, taxation became a crushing burden, the Avars and Slavs devastated the northern border, the Lombards overran most of Italy. Inefficient or unfortunate rulers succeeded—Tiberius Constantinus (578-582), Maurice (582-602), and Phocas (602-610)—until, after the death of the last, Heraclius became Emperor (610-641). He humbled Persia, which had been the great opponent of Byzantium, and by 628 he had restored the Empire to its old supremacy in the East and was hailed as "the new Scipio." But the provinces of the Empire were exhausted by the long wars and had suffered from the hostile occupation. Consequently, when the Arabs began

their great missionary conquests the emperors were too weak to oppose them successfully and were forced to see one after another of their provinces wrested from their grasp. The house of Heraclius furnished two other able emperors—Constans II (641-668) and his son, Constantine (668-685), who fought bravely against the Mussulmans and checked their advance. But the reign of Justinian II (685-695 and 705-711) was disastrous, and after his death anarchy brought the Empire to the verge of ruin. The rebel, Leo the Isaurian (717-741), saved the state. He defended Constantinople during the long siege by the Saracens and reorganized the Empire, which, in spite of the efforts and ability of Heraclius and his grandson and great-grandson, had been steadily decaying. Leo's descendants are remembered chiefly for their efforts to restrict the worship of images. (See ICONOCLASM.) But this is not just, as the Empire gained in strength and prosperity under the Isaurian dynasty. Constantine Copronymus (741-775) was a great warrior and extended the boundaries of the Empire both in Asia and Europe. He reformed the administration, planted colonies along the frontiers, and encouraged commerce. His son, Leo IV (775-780), was able, but he was succeeded by his son, Constantine (780-797), a boy of nine. The latter was under the guardianship of his mother, Irene, until he was 21. Then the two reigned conjointly until 797, when Irene had her son blinded and deposed. Her five years of rule (797-802) were very disastrous to the Empire. Nicephorus I (802-811) was compelled to pay tribute to the Caliph Harun-al-Rashid in order to make peace with him, and was slain by the Bulgarians. After two years of disaster Leo the Armenian (813-820) defeated the Bulgarians and began a prosperous reign, only to be murdered by conspirators. Under Michael the Amorion (820-829) the Saracens conquered Crete and began the subjugation of Sicily. His son, Theophilus (829-842), was engaged in almost constant warfare, bloody but indecisive, with the Caliphs. His reign, however, was prosperous at home, and he was renowned for his justice and the great buildings which he constructed. The Empire in his time was wealthy, and Constantinople was the centre of European trade. His son, Michael III (842-867), was only four years old when he became Emperor. He grew up a drunkard, and no one attempted to revenge his death when Basil the Macedonian (867-886), whom he had made co-Emperor, caused him to be murdered.

Under the emperors of the Macedonian line the government was strengthened by the regular transmission of the Imperial power. In fact, the whole period from 717 to 1057 was a time when the Empire was on the whole prosperous, well administered, and triumphant. Basil was successful in all his wars, except in Sicily, where Syracuse was captured by the Saracens in 878. He had great ability; his code of laws remained in use for centuries. His son, Leo the Wise (886-912), and his grandson, Constantine Porphyrogenitus (912-959), were literary men of no mean ability. Fortunately the Empire was prosperous and its enemies were weak. Romanus II (959-963), son of Constantine, reconquered Crete through his able general, Nicephorus Phocas. The latter became Emperor (963-969) by marrying Romanus' sister, but he ruled the Empire in the name of his two stepsons,

Basil II (963–1025) and Constantine VIII (963–1028), and the same was done by John Zimisceus (969–978), who murdered Nicephorus and married his widow. Like Nicephorus, John Zimisceus was an able soldier. He defeated the Russians and reconquered Antioch and Edessa from the Saracens. Basil II succeeded to the Empire, crushed the Bulgarians, and extended his dominions farther than any Emperor since Justinian. Constantine VIII was sole Emperor from 1025 to 1028. He had taken little part in the government before and was very weak. On his death without a son the husbands and creatures of his daughter Zoë ruled the Empire for 26 years. It was, on the whole, a very disastrous period. But Theodora, Zoë's sister, who ruled from 1054 to 1056, was able and virtuous. The Macedonian line ended the following year.

For 24 years there was a succession of emperors of little importance, none of them able to cope with the Seljukian Turks, who rapidly conquered all of the Asiatic possessions of the Empire. Alexius Comnenus (1081–1118) was compelled to face new dangers from the attacks of the Normans and the armies of the Crusaders. He struggled bravely and was successful in many respects. But unfortunately the finances of the Empire were seriously impaired by the diversion of commerce from Constantinople occasioned by the growth of the Italian cities and the foundation of the Kingdom of Jerusalem. In addition, the policy of Alexius caused the Greeks to be bitterly hated by the Crusaders. Alexius was succeeded by John the Good (1118–43), who was vigorous and warlike. He was constantly engaged in fighting the Seljuks, Hungarians, Serbians, and Armenians. Manuel Comnenus (1143–80) engaged in many wars for his own personal glory, but neglected the finances and government, so that he left the Empire in a bad condition. In the next 24 years incompetent rulers brought the Empire to the verge of ruin. Cyprus was lost, Bulgaria became independent, and the Seljuks threatened to conquer Constantinople. The Venetians were hostile, and allied themselves for an expedition with the Crusaders, who coveted the riches of Constantinople, which seemed to them fabulous. In 1204 Constantinople was taken and sacked and the Latin Empire established. This was very weak and lasted only until 1261, when Michael Palæologus, the ruler of Nicæa, the strongest of the Greek states which had arisen when the capital was captured by the Franks, expelled the Latins and reestablished a Byzantine Empire. But this Empire was much smaller than it had been in 1204, and the ruling family, the Palæologi, were unable to make it powerful. Michael VIII (1261–82) attempted to gain allies by offering to bring the Greek church under the authority of the Pope. His son, Andronicus II (1282–1328), was utterly incompetent, and the last years of his reign were filled with civil wars. A period of disaster followed. The command of the sea was lost, the finances were in hopeless disorder, and the rulers were weak. The Ottoman Turks were now establishing their power on the ruins of the Seljukian realm in Asia Minor, and one by one they conquered the provinces of the Empire. Under John V (1341–91) the Turks made their first permanent conquest in Europe by seizing Gallipoli in 1354. Manuel II (1391–1425) and John VIII (1425–48) were feeble rulers and practically vassals of the Sultan. Constantine XI (1448–53) struggled

bravely but unsuccessfully to retain his capital, the only portion of the Empire which was left, and finally, in 1453, Constantinople was taken by the Turks. The seizure of the capital marks the end of the Byzantine Empire.

Until recently it has been the fashion to treat the Byzantine Empire with contempt. Gibbon described its history as "a tedious and uniform tale of weakness and misery." Voltaire spoke of it as "a worthless repertory of declamation and miracles, disgraceful to the human mind." Montesquieu wrote: "The history of the Greek Empire, from Phocas on, is merely a succession of revolts, schisms, and treacheries." Taine condemned it as "a gigantic moldiness lasting a thousand years." In 1854 a writer in an English review rejoiced over the supposed moment when the last Byzantine historian was blown into the air by "our brave allies the Turks." But in the last half-century all this has been changed. Scholars now recognize the inestimable debt which we owe to the Byzantine Empire. They realize that for eight centuries the Roman Empire, transplanted to New Rome, i.e., Constantinople, persisted in its task; that law, literature, industry, and commerce did not cease to flourish; that Constantinople stemmed the tide of invasion from the East, which otherwise might have engulfed all Europe. They have learned that the most striking feature of Byzantine history is "its constant vitality and power of revival," its "marvelous recuperative energy," shown at every crisis in its history.

It is impossible to characterize this history as a whole, because it covers a period of time greater in length than the history of England from the Norman Conquest to the present day. For more than 1000 years dynasties changed, wars and revolutions took place, the fortunes of the Empire sank and rose again. Of the 107 persons who ruled from 395 to 1453 as emperors or associates of emperors, 20 were assassinated, 18 were blinded or otherwise mutilated, 12 died in a monastery or a prison, 12 abdicated under compulsion or of their own free will, 3 died of starvation, 8 died in battle, or as a result of accident—a total of 73. Vice, corruption, and cruelty were the dominant features at some periods; the government was despotic; the people were superstitious, effeminate, and servile. Yet the Empire lived on; the administration and organization remained effective; the traditions and civilization of Old Rome were maintained. Great wealth, which was a source of wonder to all visitors, was accumulated, and great armies, which were the most effective in the world, were maintained. If any scholar, in spite of the complexity of Byzantine history, should attempt a generalization, probably he would say, as Frederic Harrison has said—"first, that the Byzantine Empire preserved more of the tradition, civil and military organization, wealth, art, and literature of the older Rome than existed elsewhere; and, secondly, that in many essentials of civilization it was more modern than the nascent nations of the West." These are the two facts which are most striking, its antiquity and modernity, and just here is one of the reasons why Byzantine history is not attractive to us; its antiquity seems only an aping of the past; its modernity fails to interest us because we have reached a higher development than the Byzantine Empire ever did.

New Rome, like Old Rome, had a wonderful capacity for absorbing and assimilating less civ-

ilized peoples. The Empire included representatives of all the races of eastern Europe. It opened to all full participation in its life. Its emperors might be of any nationality. Any barbarian of ability, if baptized, was welcome to its army, administration, and court. This was one of the causes of its strength. A second was the position of Constantinople. The city could not be reduced to starvation. Its walls, until 1204, proved strong enough to defy all invaders. Then, too, while the Western Empire was being overrun by the barbarians, the Asiatic provinces of New Rome enjoyed an almost continuous peace. From their wealth the Empire secured the resources necessary to hold its European possessions and to carry on the wars of Justinian. Finally, it was fortunate in having a large number of able emperors. Most of them were not brilliant personalities who command admiration, but rather cautious administrators, indefatigable workers, who labored slowly and steadily to strengthen the Empire, to fill the treasury, and to improve the administrative service.

The Empire, although conservative, was not wholly unprogressive. This is exemplified in its military organization, its law, its art, and its manufactures. Thus, after the battle of Adrianople (q.v.), the Byzantines realized the fact that the old infantry army was no longer efficient, and formed a new army mainly of cavalry. The infantry they supplied with bows and lances in place of swords and javelins. They developed armor for protection. They used a smaller and more effective tactical unit than the old legion, and they recruited an army of subjects, not mercenaries. They developed the art of fortification and the use of Greek fire. They built a great navy. Oman says: "The art of war as it was understood at Constantinople in the tenth century was the only system of real merit existing in the world; no Western nation could have afforded such a training to its officers till the sixteenth, or we may even say the seventeenth century." The *Corpus* of Justinian continued for centuries to be the law of the Byzantine Empire. But it was constantly modified and expanded to suit new conditions. In the ninth century a new code was drawn up (see *BASILICA*) in which the influences of Christianity and advancing civilization are marked. A maritime code, a military code, and a rural code were developed to meet the changed conditions. The first, especially, is of great importance in the history of legal ideas. Byzantine art (q.v.) is treated at length elsewhere. Here it deserves mention as an indication of the great influence which the Byzantine Empire exercised on Russia, on the Mohammedan caliphates in the East and West, on the south of Italy, on Venice, and on some parts of France and Germany. To-day examples of Byzantine architecture are to be found in every Christian and Mohammedan country. In the manufacture of mosaics, silks, and embroidered satins, the Byzantine Empire was preëminent for centuries. The samite and sendal of the mediæval romances came from Constantinople.

The direct services of the Byzantine Empire to Europe were many and varied. Four, in particular, deserve emphasis. 1. It was the bulwark of Europe from which host after host of invaders were beaten back. For seven centuries, almost unaided, it bore the brunt of every attack and thus enabled the Western nations to develop and gain strength. 2. It preserved the

Greek and Roman culture and transmitted it to western Europe as the people of the younger nations became sufficiently advanced to share in the priceless heritage. Some of this culture was constantly filtering through, but during the period of the Crusades and later, the transmission was most marked. 3. It maintained the world's commerce, which for centuries was centered at Constantinople. The pupils, whom Constantinople had formed, Venice and Amalfi, wrested the sceptre of the seas from her only in the eleventh century. 4. It was the civilizer of all eastern Europe, where the influence of the Greek church, Greek art and architecture, and Greek administration is now everywhere evident.

Bibliography. The original authorities for the history of the Byzantine Empire are the authors whose works are included in the collection of the Byzantine historians. The first edition was published in Paris, in 36 vols., between 1648 and 1711. This collection was reprinted with additions in Venice, 1727-36. In the nineteenth century Niebuhr, assisted by Bekker, the Dindorfs, and others, edited the so-called "Bonn Edition" under the name of the *Corpus Scriptorum Historiæ Byzantinæ*. But this last edition is extremely unscholarly. There are separate editions of the most prominent chroniclers, which will be found under their respective names. Of the secondary works, the following may be mentioned: Finlay, *History of Greece from B.C. 146 to A.D. 1864*, ed. by Tozer (7 vols., Oxford, 1877); Gibbon, *Decline and Fall of the Roman Empire*, ed. by Bury (7 vols., London, 1896-1901); Krumbacher, *Geschichte der byzantinischen Litteratur* (Munich, 1897); Bury, *The Later Roman Empire* (New York, 1889); and *History of the Eastern Roman Empire* (London and New York, 1912); Heyd, *Histoire du commerce du Levant au Moyen Age* (Leipzig and Dessau, 1885); Diehl, *Études byzantines* (Paris, 1905); Krause, *Die Byzantiner des Mittelalters in ihrem Staats-, Hof-, und Privatleben* (Halle, 1869); Rambaud, *L'Empire grec au Xme siècle* (Paris, 1870); Pears, *Fall of Constantinople* (New York, 1885); Oman, *Byzantine Empire* (London, 1892); W. G. Holmes, *Age of Justinian and Theodora* (New York, 1905); J. Gay, *L'Italie meridionale et l'Empire byzantin* (Paris, 1904); Harrison, *Byzantine History in the Early Middle Ages* (London, 1900); Diehl, *Justinien et la civilization byzantine* (Paris, 1901); Gelzer, *Byzantinische Kulturgeschichte* (Tübingen, 1909); Dieterich, *Hofleben in Byzanz* (Leipzig, 1912); Rambaud, *Études sur l'histoire byzantine* (Paris, 1912). Very useful bibliographical clues can be found in the appendices and notes to Bury's edition of Gibbon.

LIST OF EMPERORS OF THE BYZANTINE EMPIRE

Arcadius, 395-408.	Justinian I, 527-565.
Theodosius II, 408-450.	Justin II, 565-578.
Marcian, 450-457.	Tiberius Constantinus, 578-582.
Leo I, the Thracian, 457-474.	Maurice, 582-602.
Zeno, the Isaurian, 474-491.	Phocas, 602-610.
Anastasius I, 491-518.	
Justin I, 518-527.	

HERACLIAN DYNASTY, 610-717

Heraclius I, 610-641.	Leontius, 695-698.
Heraclius Constantinus, 641.	Tiberius Appsimarus, 698-705.
Heraclionas, 641-642.	Justinian II (restored), 705-711.
Constantinus (Constans II), 642-668.	Philip Bardanes, 711-713.
Constantine IV or V, <i>Pogonatus</i> , 668-685.	Artemius Anastasius, 713-716.
Justinian II, 685-695.	Theodosius III, 716-717.

SYRIAN (ISAURIAN) DYNASTY, 717-820

Leo III, the Isaurian, 717-741.
Constantine V, or VI, *Copronymus*, 741-775.
Leo IV, the Chaza, 775-780.
Constantine VI or VII, 780-797.
Irene, 797-802.
Nicephorus I, 802-811.
Stauracius, 811.
Michael I, *Rhangabe*, 811-813.
Leo V, the Armenian, 813-820.

AMORIAN DYNASTY, 820-867

Michael II, the Stammerer, 820-829.
Theophilus, 829-842.
Michael III, the Drunkard, 842-867.

BASILIAN OR ARMENIAN (MACEDONIAN) DYNASTY, 867-1057

Basil I, the Macedonian, 867-886.
Leo VI, the Wise, 886-912.
Constantine VII, *Porphyrogenitus*, 912-959.
Alexander, Associate Emperor, 912-913.
Romanus I, *Lecapenus*, 920-944. (Associate Emperor together with his three sons, Christopher, Stephen, and Constantine.)
Romanus II, 959-963.
Basil II, *Bulgaroctonus*, 963-1025.
Nicephorus II, Phocas, 963-969, associated with Basil II.
John I, Zimisces, 969-976, associated with Basil II.
Constantine VIII, 1025-1028.
Romanus III, *Argyrus*, 1028-1034.
Michael IV, the Paphlagonian, 1034-1041.
Michael V, 1041-1042.
Constantine IX, *Monomachus*, 1042-1054. (Reigns with his wife, Zoë.)
Theodora, 1054-1056.
Michael VI, *Stratioticus*, 1056-1057.
Issac I, Comnenus, 1057-1059.
Constantine X, Ducas, 1059-1067.
Eudocia (in the name of her sons, Michael VII, Andronicus and Constantine, and with her second husband, Romanus IV), 1067-1071.
Michael VII (see above), 1071-1078.
Nicephorus III, Botaniates, 1078-1081.

COMNENIAN DYNASTY, 1081-1185

Alexius I, Comnenus, 1081-1118.
John II, or Caloiohannes, Comnenus, 1118-1143.
Manuel I, Comnenus, 1143-1180.
Alexius II, Comnenus, 1180-1183.
Andronicus I, Comnenus, 1183-1185.

THE ANGELIAN DYNASTY, 1185-1204

Issac II, Angelus, 1185-1195.
Alexius III, Angelus, 1195-1203.
Isaac II (restored) ? 1203.
Alexius IV, Angelus, 1204.
Alexius V, Ducas, 1204.

LATIN EMPERORS OF THE EAST, 1204-1261

Baldwin I, 1204-1206.
Henry of Flanders, 1206-1216.
Peter of Courtenay, 1216-1217.
Yolande, 1217-1221.
Robert, 1221-1228.
Baldwin II, 1228-1261.
John of Brienne, 1229-1237.

NICEAN EMPERORS, 1206-1261

Theodore I, Lascaris, 1206-22.
John III, Ducas, 1222-54.
Theodore II, Ducas, 1254-59.
John IV, Ducas, 1258-61.

THE EMPIRE RESTORED: THE PALEOLOGI, 1261-1453

Michael VIII, Paleologus, 1261-82.
Andronicus II, Paleologus, 1282-1328.
Andronicus III, Paleologus, 1328-41.
John V, Paleologus, 1341-91.
(John Cantacuzenus, Co-Emperor, 1347-55).
Manuel II, 1391-1425 (John VII, Co-Emperor, 1398-1402).
John VI, 1425-48.
Constantine XI, 1448-53.

BYZANTINES. In numismatics, the term applied to coins of the Byzantine Empire. Byzantine coins are of gold, silver, and bronze, bear impressions distinct from those of the earlier Roman coins, and were copied in several countries where the Byzantine standard was adopted. The commercial relations of the Eastern Empire served to distribute its coinage over almost all the then known world. It was cur-

rent in India as well as in the north of Europe. Consult Saulcy, *Essai de classification de suites monétaires byzantines* (Metz, 1836), and see BESANTS; NUMISMATICS.

BYZANTIUM, bí-zán'shī-üm (Gk. Βυζάντιον, *Byzantion*). A city which stood on the Thracian Bosphorus, at the east end of the Propontis. It was founded about 660 B.C., by Dorian colonists, probably from Megara, and rapidly rose in importance as a seat of commerce. Its position was at once secure and enchanting; it commanded the shores of Europe and Asia. It had a splendid harbor, and the fisheries brought the city much wealth. After a time of subjugation under Darius Hystaspes, Byzantium was occupied and colonized by the Spartan general Pausanias (q.v.). Later the city joined the Delian League, and its importance is shown by its large contributions. At the time of the Samian revolt (440 B.C.; see SAMOS) Byzantium seems to have tried to withdraw. It reappears in the tribute lists two years later, and remained loyal to Athens until 411 B.C., when it joined Sparta. Retaken by Alcibiades (409 B.C.), it was again captured by Lysander (q.v.) after the battle of Ægospotami. Spartan tyranny led to a change of feeling, and about 390 B.C. Thrasybulus, the Athenian, reestablished the democracy, and before 378 B.C. Byzantium concluded a treaty of alliance with Athens. This friendship was of short duration, and finally, in 357 B.C., Byzantium leagued itself with Chios, Rhodes, and King Mausolus II of Caria, in the Social War. In 341-40 B.C. Philip of Macedon advanced against the city, and, under the influence of Demosthenes, the citizens once more joined Athens. The Athenians, under Phocion (q.v.), forced Philip to raise the siege of the city. Under Alexander the Great Byzantium was subject to Macedonia; under his successors, however, it regained its independence. For some years after 278 B.C. it was subject to a heavy tribute imposed by the Celts. The duties imposed on ships as a means of meeting this burden led to a war with Rhodes, in which the city was supported by Attalus I of Pergamum. During the Roman wars with Antiochus and Mithridates Byzantium seems to have supported Rome, and, as a result, in spite of some suffering in the Mithridatic wars, enjoyed considerable prosperity. Later it became subject to the direct control of the emperors and was required to pay a heavy tribute, till this was remitted by Claudius. Vespasian deprived the city finally of all independence. In the civil war between Septimius Severus and Pescennius Niger, Byzantium sided with the latter. It was therefore besieged by Severus and, after a brave defense of three years' duration, was captured in 196 A.D. and reduced to ruins. Severus, repenting the desolation which he had made, rebuilt a part of the city, ornamented it with baths, porticoes, etc. He or Caracalla restored to the inhabitants their ancient privileges. Under Gallienus the city again suffered severely. In 330 A.D., after the defeat of Licinius, Constantine made the city the capital of the Roman Empire, under the name of Constantinople (q.v.).

C

C The third letter in the Latin, as in all alphabets that are derived from it. In position the letter *c* corresponds to the Greek gamma (Γ) from which its form is actually derived through curvature or rounding. The Greek letter no doubt comes from the North Semitic *gimel*, the origin and significance of which are still uncertain. See ALPHABET.

Phonetic Character. In sound the Latin *c* originally had the same force as the Greek gamma (Γ) from which it is adapted, and this old value is seen in such Latin abbreviations of proper names as *C.* for *Gaius*, *Cn.* for *Gnaeus*; but in Latin *C* later began to take on the force and function of *K*, which was falling into disuse, and a new letter *G* (a modification of *C*) was introduced to represent that voiced guttural *g*-sound. (See *G*.) The *k*-sound of *c* continued in Latin down to at least the eighth century of the Christian era; and that is also its power in the Anglo-Saxon or Old English, when "king" is written *Cyning*, and "queen" *cwēn*, as there was no *q* during that period. The later differentiation or changes of the sound of *c* from the old stop or *k*-sound in *come* to the hissing or sibilant *s*-sound in *cetaceous*, with similar modifications, is largely due to the influence of a following *i*, *e*. These front vowels, being farther forward in the mouth than *a*, *o*, *u*, tend to change the character of the checked sound into a split or hiss. As examples of such sibilant developments, compare the pronunciation of Latin *Cicero* (Kikero), Italian *Chichero*, English *Sisero*, or again the common English pronunciation of *vici*, 'I conquered' ('vizi' instead of "wēkē"), in *veni, vidi, vici*. Of like character is such an interchange as Latin *centum*, 'hundred'; Sanskrit, *śata*. Examples of palatalization or splitting of *c* to *ch*, before *i*, *e* are especially common from Anglo-Saxon into modern English, through the Southern Dialect, e.g., AS. *cild* (*kild*), Eng. *child*; AS. *ceorl*, Eng. *churl*; AS. *sēcān*, Eng. *seek* and *besech*; or, again, Lat. *caput*, 'head'; Fr. *chef*, Eng. *chief*; Lat. *canto*, Eng. *chant*. The phonetic laws governing such interchanges as *c* with *g*, *h* in the Indo-Germanic languages may be better understood by pronouncing in succession the syllables *ac*, *ca* (with perfect closure), *ag*, *ga* (with the same closure, but voiced), and *ah*, *ha* (with imperfect closure); hence, such alternates as Lat. *ager*, 'field,' Eng. *acre*; Lat. *duc* ('lead, draw'), Eng. *tug*; Lat. *canis*, 'dog,' Gk. *κυν*, *kun*; AS. *hun-d*, 'hound.' (See PHONETIC

LAWs.) In usage, as a letter compared with *k*, the Germanic alphabets, which are under obligation to the Greek as well as to the Latin, adopted *k*, from the Greek *kappa*, to represent the guttural sound. For this reason *c* alone in German and Swedish, etc., hardly occurs outside of words of Romance origin. In Modern English *c* is practically superfluous, as far as sound representation is necessarily concerned; the letter *k* might easily take its place in recording the stop sound of *c* before *a*, *o*, *u*, and the letter *s* might readily be substituted for the hissing sound of *c* before *e*, *i*.

As Abbreviation. In music *C* is the first tone, or keynote of the diatonic scale of *C* major. *C* = 100; *°C* = Centigrade (thermometer scale); *B.C.* = before Christ; *c.* = *cent*, *centime*, etc.; and it is used in some other familiar abbreviations.

CAABA, kă'ā-bā or kă'bā. See KAABA.

CAALING, or **CA'ING** (kă'ing), **WHALE** (Scotch, *ca*, *caa*, to drive), or **BLACKFISH**. A large, porpoise-like cetacean, of the Killer family (Delphinidae) and genus *Globiocephalus*, principally characterized by its globose head. They go in large schools, crowding after a leader; and as they yield a fair amount of oil similar (but inferior) to sperm oil, and their flesh is savory, they are incidentally an object of the sea chase. The caaling whale proper (*Globiocephalus melas*) is 20 feet long, black, with a white abdominal area, has very long and narrow pectoral fins, and inhabits the colder parts of the Atlantic, appearing on our coast southward to New York, south of which it is replaced by a short-finned black species (*Globiocephalus brachypterus*). The Pacific has a widespread species (*Globiocephalus scammoni*), wholly black, and much pursued by whalers. The food of all is mainly squids, but fish are also eaten. See **WHALE**.

CAAMA, kă'mā, or **KAAMA**. 1. A small South African fox or fennec (*Fennecus caama*, or *Vulpes chama*), rarer than formerly, whose fur is of some value. It is about 3 feet in length, slender in form, its long soft fur silvery-gray above and on the sides of the body. It has the habits of a fennec (q.v.) and lives largely on insects and fruit, while it is said also to devour the eggs and young of ostriches and other ground-nesting birds. It is also called asse and silver or vaal jackal by the colonists. 2. The *Bubalis caama*. See **HARTBEEST**.

CAAZAPA, kă'ā-să'pā. A town of the Republic of Paraguay, situated 25 miles south of Villa Rica, with which it is connected by rail-

road (Map: Paraguay, F 9). It is the centre of a fertile agricultural region. Pop., about 12,000.

CAB. See CARRIAGE.

CABABISCH, ká-bá'bësh. An Arab tribe in Africa, inhabiting the immense deserts of eastern Sudan, between Dongola, Darfur, and Kordofan.

CABAL' (Fr. *cabale*, from *cabbala*, on account of its secrecy). The designation of an unpopular English ministry (1667-73), composed of Clifford, Ashley, Buckingham, Arlington, and Lauderdale, the initials of whose names coincidentally spelt Cabal.

CABALLERO, ká'bá-lyá'ró, FERNÁN (1796-1877). The pseudonym of Cecilia Böhl von Faber, a Spanish novelist. She was born in Switzerland and educated in Germany, but in 1815 accompanied her father to Spain and soon became enthusiastically attached to her adopted country. She was married three times. Her first husband was Antonio Planells y Bardaxi, an infantry captain who caused her a deal of suffering, and who was killed in action in 1817. Her second husband was Francisco Ruiz del Arco, Marqués de Arco Hermoso, an officer in one of the household regiments of the royal family. Two years after his death, in 1835, she married Antonio Arrón de Ayala, who was sent to Australia as Consul. Successful business enterprises were followed by unfortunate speculations which led to his suicide in 1859. She was a real polyglot writer. In 1840 she published anonymously in German a romance entitled *Sola*. Her first novel in Spanish, *La Gaviota*, was published in 1849, but she had written it in French, and José Joaquín de Mora had translated it into Spanish. Many other works followed, the chief of which are: *La Familia de Albarada* (1880), the first draft of which was written in German; *Clemencia* (1887); and *Elia*. She also published the first collection ever made of Spanish popular tales and poems, *Cuentos y poesías populares andalucés* (1859). Her principal novels have been translated into most European languages. It has recently been discovered that she was an exquisite letter writer, and critics who have been able to examine her voluminous correspondence with Antoine de Latour hail her as the Madame de Sévigné of modern Spanish literature. A critical edition of this correspondence is in preparation. Her *Obras Completas* appeared in 18 vols. (Madrid, 1855-67), and have since then been reprinted in the *Colección de Escritores castellanos*. Consult A. de Latour, *Etudes littéraires sur l'Espagne contemporaine* (Paris, 1864), and *Espagne, traditions, mœurs et littérature* (Paris, 1869); F. de Gabriel y Ruiz de Apodaca, *Últimas producciones de Fernán Caballero*, with a biography (Seville, 1878); José María Asensio *Fernán Caballero y la novela contemporánea* (Madrid, 1893); A. Morel-Fatio, "Fernán Caballero, d'après sa correspondance avec Antoine de Latour" in the *Bulletin Hispanique*, vol. iii (Bordeaux, 1901), reproduced in his *Etudes sur l'Espagne, 3^e série* (Paris, 1904); Pitoulet, *Les premiers essais littéraires de Fernán Caballero* (Paris, 1908); Coloma, *Recuerdos de Fernán Caballero* (Bilbao, 1910).

CABANATUAN, ká-bá'ná-twán'. A town of Luzon, Philippines, in the Province of Nueva Ecija, situated 13 miles north of San Isidro. It has a telegraph station. Pop., 1903, 7109.

CABANEL, ká'bá'nél', ALEXANDRE (1823-89). A French historical and portrait painter. He

was born at Montpellier, studied with Picot, and obtained the *Prix de Rome* in 1843. Extremely popular from the beginning, he was the recipient of numerous medals, elected to the Institute in 1863, and made professor in the Académie des Beaux-Arts. As successor of Ingres at the head of the classical school, he was completely academic in his methods—correct in line and composition, indifferent in color, and lacking in feeling. His taste and distinction of style eminently adapted him to portray the nobility, and his art became the vogue in these circles. Among his sitters were Napoleon III and his ministers, but he succeeded best with his portraits of women. Though beautiful in features and distinguished in appearance, his portraits lack strength and individuality and are consequently insipid. Like his historical paintings, they were formerly very popular in the United States; the Metropolitan Museum, New York, has a good example, "Miss Catherine Wolfe." His chief historical paintings include the "Death of Moses" (Corcoran Gallery, Washington); "Birth of Venus," reputed his masterpiece (1863), in Musée du Luxembourg; replica in Metropolitan Museum; "Death of Francesca da Rimini and Paolo," in the Luxembourg, which possesses a large collection of his works; others in the provincial museums of France; and large decorative paintings illustrating the history of St. Louis, in the Panthéon, Paris.

CABANIS, ká'bá-nēs', JEAN LOUIS (1816-1906). A German ornithologist, born in Berlin, and educated at the university there. In 1839-41 he made ornithologic researches in North and South Carolina and in 1849 was appointed custodian of the ornithological collections of the Berlin Zoölogical Museum. The investigations which had so important an effect in determining a natural system of classification were published by him first (1847) in Wiegmann's *Archiv für Naturgeschichte*, entitled "Ornithologischen Notizen," and more fully in the *Museum Heineanum* (4 parts, Halberstadt, 1850-63). He founded the *Journal für Ornithologie* in 1853 and edited it for 40 years, being succeeded in 1894 by his son-in-law, Dr. A. Reichenow. His writings on ornithology number several hundred titles and relate to the birds of all countries. He contributed the ornithological parts of Tschudi's *Fauna Peruana* (Berlin, 1845-46), of Schomburgk's *Reisen in British-Guayana* (Berlin, 1848), and of Von der Decken's *Reisen in Ostafrika* (Berlin, 1869). He retired from the active administrative work of the Berlin Museum in 1891 and died Feb. 20, 1906.

CABANIS, PIERRE JEAN GEORGE (1757-1808). A French physician and philosopher. He was born in Cosnac, studied in Paris, and in the year 1773 went to Warsaw as secretary to a Polish magnate. On his return to Paris he was for some time engaged in literary pursuits, from which he turned his attention to the study of medicine. During the Revolution, whose tendencies he fully approved, he became the warm friend and physician of Mirabeau. After the death of the latter, in order to refute the charge of having poisoned him, Cabanis published the *Journal de la maladie et de la mort de Honoré de Mirabeau* (1791). Among the papers of Mirabeau was found an extensive work on public education in the handwriting of Cabanis. This had been used by Mirabeau in his public discourses. Cabanis took a leading part in the reorganization of the French schools of medicine

and held several professorships in them. He was one of the Council of Five Hundred and afterward a member of the Senate. In his psychological investigations Cabanis steered clear of metaphysics. Thus he remained strictly within the domain of experiment when inquiring into the origin of psychological impressions and into the influence of age, sex, temperament, disease, diet, climate, etc., on the development of ideas, instincts, and passions. His scientific views on subjects of this nature have led many to believe that Cabanis was a materialist and an atheist. It must be borne in mind, however, that the study of thought in its dependence on the brain does not necessarily imply that thought is in its nature material. And if Cabanis speaks of the brain from a physiological point of view as assimilating impressions and secreting thought, just as the stomach digests food, he is not therefore necessarily a materialist. As a matter of fact, in his metaphysical *Lettres sur les causes premières* he clearly expresses his willingness to admit a spiritual and immortal soul and a personal God, although he does not make clear how he would reconcile this with his psychology. His complete works were published with a biography at Paris, 1823-25. The best edition of Cabanis' chief work, the *Rapports du physique et du moral de l'homme*, was published by Peisse (Paris, 1844). Consult Dubois, *Examen des doctrines de Cabanis* (2 vols., Paris, 1842); F. Labrousse, *Quelques Notes sur Cabanis* (Paris, 1903).

CABARET, kă-băr-ă' (Fr. *cabaret*, wine shop). A restaurant which furnishes vaudeville entertainment with meals. The original form of the modern cabaret was the café chantant of Paris. Ambitious American proprietors imported the café chantant to San Francisco, where several of these "musical restaurants," as they are known in California, were very famous.

From the West the fashion of high-priced vaudeville with meals traveled East via Chicago. The café chantant, with its simple entertainment of singing, instrumental music, and dancing greatly elaborated, was first known as the cabaret when introduced to New York in the latter part of 1910. The fashion spread and the restaurants vied with each other in the quantity and quality of the entertainment furnished with the meals. At some places, instead of the original two or three vocalists there would be fifteen or twenty dancers and entertainers with a programme that would be varied from week to week.

Since then, in the train of the cabaret, and as part of it, have grown up with the rage for dancing, the tea dances, or dansants, as general amusement features offered by popular restaurants.

CABARRUS, kă'bă'rŭs', FRANKOIS, COMTE DE (1752-1810). A Spanish financier of French birth. He organized the San Carlos Bank and a company for trade with the Philippine Islands; was one of the Council of Finance under Charles III and proposed many reforms. Under Charles IV he was accused of embezzlement and was imprisoned, but was soon released and raised to the rank of count. Joseph Bonaparte made him Minister of Finance, in which office he died. His daughter Thérèse, under the name of Madame Tallien, afterward Princess of Chimay, was conspicuous in the closing days of the French Revolution. His *Cartas sobre la felicidad publica* was published posthumously in 1813.

CABARRUS, PRINCESS DE. See CHIMAY.

CABAT, kă'bă', LOUIS (1812-93). A French

landscape painter, born in Paris. He studied with Camille Flers, but the works of Constable exhibited in Paris had a determinative influence upon his art. In 1834 his "The Pool of Ville d'Avray," now in the Louvre, and "Gardens of Beaujan," sold in 1857 for the then extraordinary sum of 23,000 francs, achieved remarkable success, and he was acclaimed the principal representative of the new realistic landscape school. He was one of the first to discover the beauties of the Forest of Fontainebleau, where he settled in 1835, and he was associated with Dupré in travels through the French provinces. In 1837 he made his first visit to Italy, which he intended to depict in the new realistic manner, but he unfortunately fell under the ban of Poussin's classic art. This influence was increased by later visits, with the result that his art deteriorated and became insipid. However, it brought him high honors. In 1867 he was elected member of the Institute, and from 1879 to 1885 he was director of the French Academy in Rome. His drawings and aquarelles are highly prized. He is represented in the Louvre, in addition to the painting mentioned above, by "Autumn Evening," and the "Game of Bowls," an aquarelle; in the Luxembourg by "Environs of Paris," a water color, and by oil paintings in the museums of Havre, Lille, Nantes, Grenoble, and Liège.

CABATUAN, kă'bă-twân'. A city of the Province of Iloilo, on the island of Panay, Philippines. It is situated on the river Tiguin and is connected by roads with the important towns on the island. Pop., 1903, 16,497.

CABAZOTIC ACID. See PICRIC ACID.

CABBAGE (OF. *cabus* in *chou cabus*, headed cole, OHG. *Kabuz*, Ger. *Kappus*, *Kappes*, from Lat. *caput*, head) (*Brassica oleracea*). A plant in general cultivation for culinary purposes and for feeding cattle. It is a native of the rocky shores of Great Britain and other parts of Europe, and in its wild state is generally from 1 foot to 2 feet high. It has been cultivated in Europe from time immemorial and has developed, probably through continuous selection, into several different forms, such as cabbage, kale (q.v.), kohlrabi (q.v.), cauliflower (q.v.), and Brussels sprouts (q.v.).

The wild cabbage has smooth, sea-green leaves, waved and variously indented; under domestication these have developed into a head, which is the part eaten.

There are two general classes of cabbages, smooth-leaved and wrinkled-leaved. The smooth-leaved cabbages may be either green or red, the head may be conical, oblong, round, or flat, and there are early, medium, and late maturing kinds. Red cabbage is chiefly esteemed for pickling; while green cabbage is the kind most generally grown in the garden and for market. More than 100 varieties are in cultivation in the United States. The wrinkled-leaved or Savoy cabbage is a cabbage of excellent quality, but is little grown, because it is not so productive as the common green kind. Cabbage demands a rich loam soil with plenty of manure. Seed for the early crop is sown in the hotbed. The plants are set in the field, as soon in spring as the frost is out of the ground, in rows 3 feet apart and 2 feet distant in the row. For the late crop the seed is sown in beds or in hills in the open in May. The early cabbage will mature in July, while the late crop may not be harvested until freezing weather. Cabbage may be winter-

stored by putting in pits head down and covering with straw and earth or by storing in a cold, damp cellar. The tree cabbage or cow cabbage is a variety cultivated for cattle, especially in the Channel Islands and the north of France, the leaves of which do not close together into compact heads, but which is remarkable for its great height, reaching, when it is in flower, 10 feet on rich soil.

Cabbage Diseases. Cabbage is subject to a number of parasitic diseases, some of which are often very destructive. Among them is club-root, due to a low fungus, *Plasmodiophora brassicæ*, which causes peculiar swellings and outgrowths from the roots of the cabbage, often the whole root system being involved. (See CLUBROOT.) Another disease is a brown or black rot caused by attacks of bacteria, *Pseudomonas campestris*. It has been known in the United States for a dozen years and has become widely distributed. It is known to occur also in the west of Europe and is a destructive disease, often devastating whole fields. The disease attacks the cabbage at any stage of growth and often dwarfs the heads or makes them one-sided. If severe, no heads are formed, and the whole plant may be killed. Frequently the heads rot and fall off, but this is due to other agencies than the disease itself. Cut stumps of diseased cabbage show brown or black rings, and these may be traced into the head. On the leaves the margins become yellow and the veins black. The disease seems to enter by the leaves and progresses towards the stem. In many cases the leaves fall off, leaving bare stumps. The disease attacks, in addition to cabbage, turnips, cauliflower, kale, and rape. On the turnip it causes an internal brown rot. It seems to gain entrance through the gnawing of insects, slugs, etc. It remains in the soil for some time, just how long is not known, and is spread through manure and rubbish. Of less importance is the attack of the downy mildew, *Peronospora parasitica*, white rust, *Cystopus candidus*, and the root or stem rot, *Corticium vagum solani*. For remedial measures it is advised to rotate the crop, destroy all cabbage insects, pay strict attention to the seed bed, and plant on new soil whenever possible. Marked differences in susceptibility to disease have been noted, and resistant varieties should be planted where such are available.

CABBAGE BARK. See ANDIRA.

CABBAGE INSECTS. Many insects infest cabbage plants, the chief of which are as follows:

Cabbage aphid.—A plant louse (*Aphis brassicæ*), brownish black above, light green below, which infests the leaves of cabbages and turnips in both Europe and America. (See APHIDS.) **Cabbage Bug.**—A pentatomid bug (*Margantia histrionica*), called the "harlequin" on account of its brilliant coloring (black, yellow, and red), which has spread within the last half-century from Central America throughout the United States and plays havoc with cabbages and similar plants. It hibernates in tufts of grass and weeds and attacks the young plants; a strong wash of lime water is recommended as a remedy.

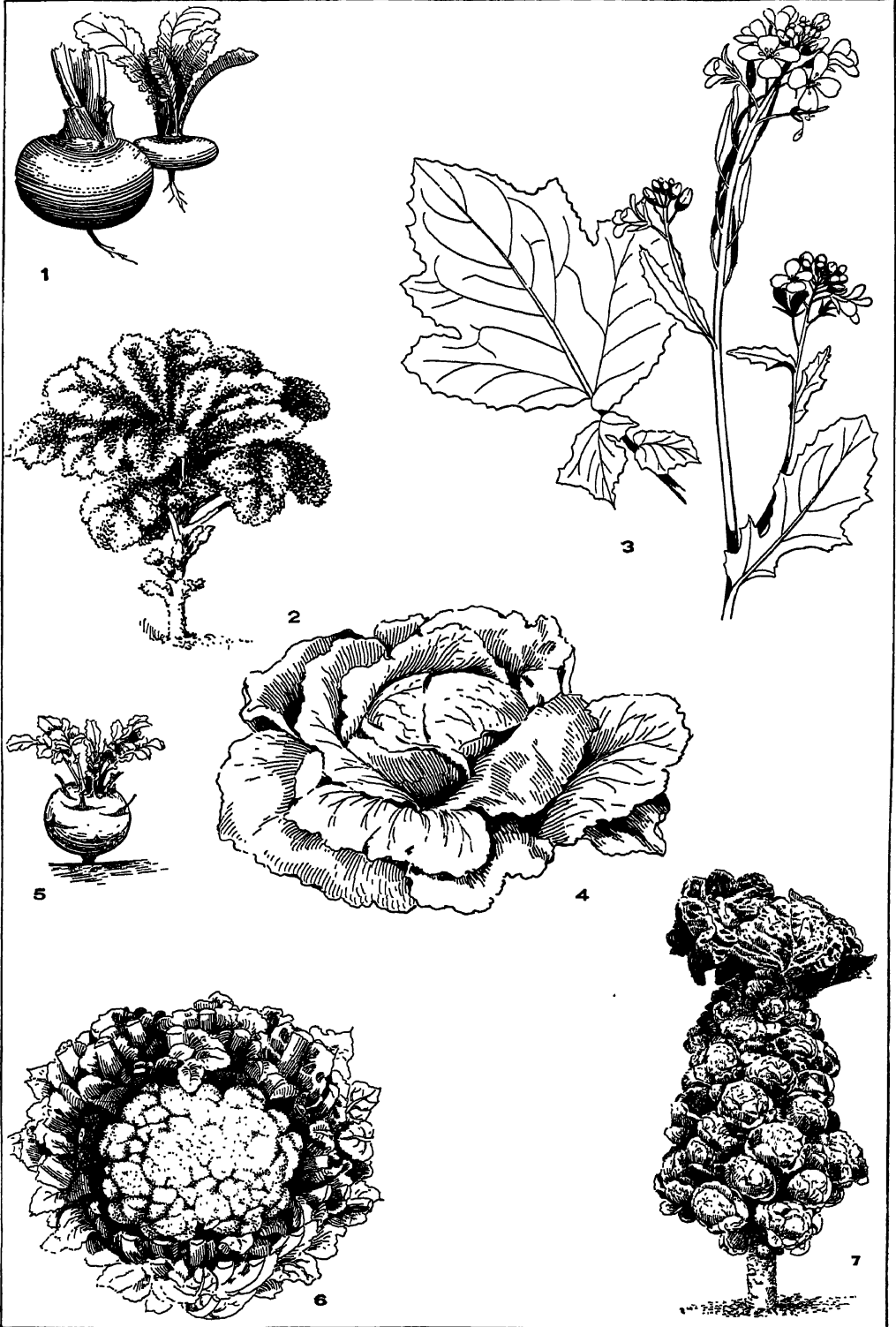
Cabbage Butterfly.—A name common to several species of white butterflies of the family Pieridæ, whose larvæ, known as cabbage worms or kale worms, feed on the leaves of the cabbage and other cruciferous plants. About a dozen species occur in North America, the most de-

structive of which is *Pieris*, or *Pontia rapæ*, a European species introduced by way of Canada about 1860 and now spread over nearly all the United States. In the North it is three-brooded and in the South is probably even more prolific. Its caterpillar has the green color of the cabbage with a lemon-yellow dorsal band; and it not only eats the leaves before heading time of the plants, but burrows through the heads. Since Paris green and other poisons cannot be used on the cabbage, this is a difficult pest to combat. Pyrethrum and kerosene emulsions are most to be relied upon and must be applied before the cabbage heads. The pupa is bare, and suspended by means of a caudal attachment and a medium girdle. The butterfly is white and pale yellow, the fore wings tipped with black; the female has two additional dots and the male one. As in all other cases of introduced pests, the cabbage butterfly does not cause as much damage now as when first introduced. Either it has acquired new parasites and other foes which keep down its numbers, or its old ones have been able to overtake it in the new country. *Pieris*, or *Pontia oleracea* is a native white form, with little or no black markings, of the northern part of the United States and southern Canada; its larvæ may also feed on the cabbage, as well as turnips, radish, cauliflower, mustard, and various other plants of economic value to man. *Pieris*, or *Pontia protodice*, whose wings are marked with grayish brown, occurs over nearly the whole of the United States; its larvæ, striped with alternate golden and greenish-purple bands, may likewise feed on cabbage. There is a very marked sexual dimorphism in this species, the female being much the more darkly marked. *Pieris*, or *Pontia brassicæ*, and *P. napi* are two other European agricultural pests of this same family, and several very beautiful species occur in South America. Our native forms are diminishing in numbers, since they cannot well compete with the hardy foreign *P. rapæ*.

Cabbage Cutworm.—The destructive larva of a cabbage moth. **Cabbage Flea.**—A flea beetle (q.v.) which attacks this and similar plants as *Haltica consobrina*; there are many forms. **Cabbage Fly.**—A small gray fly (*Phorbia brassicæ*) whose maggot preys upon the roots of cabbages; it is related to the house fly and is one of a group of garden pests, such as the turnip fly, onion fly, etc. **Cabbage Moth.**—A noctuid moth (*Mamestra picta*), whose larva is called the zebra caterpillar, being yellowish, marked by three longitudinal bands of black. It feeds on cabbage and turnip leaves and also on the cranberry. The change to the brown pupa is made in the ground in the autumn. The chestnut-brown fore wings of the moth are mottled with dark brown and white; the hind wings are pale yellow. The chrysalids should be destroyed whenever dug up with the soil, and the caterpillars should be removed from the plant and destroyed. Grooves in the soil, encircling the plants and filled with tar, gas lime, or quicklime, are said to be a protective. **Cabbage Worm.**—Any caterpillar injurious to cabbage; specifically that of the cabbage butterfly.

CABBAGE PALM, or CABBAGE TREE. A name given in different countries to different species of palm, the large terminal bud of which is eaten like cabbage. The cabbage palm of the West Indies is *Oreodora oleracea*. The southern United States also have their cabbage palm, or

CABBAGE AND ALLIES



1. TURNIPS (*Brassica campestris*).
 2. KALE (*Brassica oleracea*).
 3. BLACK MUSTARD (*Brassica nigra*).

4. CABBAGE (*Brassica oleracea* var.).
 5. KOHLRABI (*Brassica oleracea* var.).
 6. CAULIFLOWER (*Brassica oleracea* var.).
 7. BRUSSELS SPROUTS (*Brassica oleracea* var.).

cabbage tree, otherwise called the palmetto (*Sabal Palmetto*). See ARECA; PALMETTO; PALM.

CABBAGE TREE. See ANDIRA.

CABBALA (ML., Heb. *qabbālāh*, reception, as of traditional doctrine, from *qibbel*, to receive, accept, admit). The designation of a mystical system of philosophy which arose among the Jews at the beginning of the common era, as a reaction against the sober and austere form assumed by Rabbinical Judaism. It attained a great vogue after the twelfth century, spread among Christian scholars in the fifteenth and sixteenth centuries, and still prevails among the Jews of eastern Europe, though now dying out. Its adherents claimed that their doctrine rested on a revelation made to Abraham and, according to others, to Adam through the angel Raziel. The teachings were orally transmitted to the days of Moses, who in turn transmitted them to Joshua. By Joshua they were communicated to the 70 elders, and since that time passed down without interruption through chosen individuals until circumstances arose which rendered it desirable to convey the mystic lore in permanent written form. There are two written sources recognized by the Cabbalists: (1) the *Sefer Jezirah*, 'Book of Creation,' and (2) *Sefer Zohar*, 'Book of Light,' commonly known as the *Zohar*. The former is ascribed to Rabbi Akiba (died 135 A.D.); the latter to Simeon ben Jochai, a pupil of Akiba. The *Sefer Jezirah* is couched in a Hebrew similar to that found in the Mishna, but the work now extant under that name cannot date back earlier than the eighth century and may be considerably later; the *Zohar*, written in a rather obscure Aramaic, belongs to the twelfth or thirteenth century of our era and was probably composed by Moses de León of Spain. The *Sefer Jezirah* consists of a series of monologues ascribed to Abraham, in which the patriarch sets forth how he came to the recognition of the true God and then establishes in a series of aphorisms the harmony between created things on the one side, the 32 ways of wisdom, the 10 fundamental numbers, and the 22 letters of the Hebrew alphabet on the other, as manifested by the divine will. A *Sefer Jezirah* is referred to in the Babylonian and Palestinian Talmuds; but while it can hardly be identical with the book now extant under that name, yet our *Sefer Jezirah* represents a point of view which is not far removed from the tendency manifested in certain portions of the Talmud itself to interpret the doctrines of Judaism in a mystical sense. Ezekiel's vision of the heavenly chariot drawn by cherubim (see CHERUB), and the mysteries of creation as described in Genesis, furnished the points of departure for mystical speculations regarding the divine nature. The dangers involved in such speculations were recognized by the rabbis, and yet we find the best of them prone to indulge in them. The significance attached in the *Sefer Jezirah* to the letters of the alphabet is paralleled by the principle of Gematria (the term for the numerical sum of the letters comprising a word), which is recognized in the Talmud as an exegetical principle. The *Sefer Jezirah*, however, passes far beyond the current of mystic thought to be detected in the Talmud. It endeavors to explain all things as an emanation of the one Being, and that nothing exists but this Being and its manifestations. Passing still further, it endeavors to show the evolution of one Being itself, which, becoming con-

scious of itself, is transformed from a virtual into an actual Being, capable of manifesting itself. The manifestations of its Being are of two kinds—as thought and as word. As thought, it is the general intelligence; as word, it includes the general as well as the specific ideas, distinguished from one another and expressed by combinations of the letters of the alphabet. The teachings of the *Sefer Jezirah* may be summed up as follows: 1. There are four fundamental principles, one always the emanation of the other. (a) The first is the breath of the living God, without beginning or end; (b) breath of breaths, a condensation of the primeval breath; (c) primeval waters, an emanation of the breath of breaths; (d) primeval fire, arising from the primeval waters. 2. Everything in the universe forms an external circle. Primeval elements are combined and again dissolved. 3. In all manifestations the law of contraries prevails. These doctrines are more fully developed, considerably amplified, and set forth in great detail, in the *Zohar*, which has been properly designated as the Bible of the Cabbalists. The name is based on Dan. xii. 3, with which verse the book begins. The *Zohar* is in the form of a homiletical commentary on the 54 divisions into which the Pentateuch is, according to Jewish tradition, divided. The Old Testament characters and events are not interpreted in a literal sense, but everything is viewed as symbolical. Mystical thoughts are woven into the sacred name of God, each letter being specially taken up, and even the vowels and accents do not escape this process of interpretation. There are various older books than the *Zohar* in which the Cabbalistic doctrines are set forth, and numerous later ones; but there is none which enjoys such authority among Cabbalists.

In its developed form, and on the basis of the various works which, besides the *Sefer Jezirah* and the *Zohar*, may be regarded as authoritative sources, the religious philosophy of the Cabbala may be summarized as follows:

1. In regard to God, the Cabbala teaches that He is the original principle of All Being, without end and without limitations. Hence the common designation of God in Cabbalistic works is En-Sof, i.e., without end. He is absolutely perfect and unchangeable. Human wisdom cannot fathom His Being, and hence no definition can be given of Him nor any conception be formed of Him. He is the Secret of Secrets, the First of the First, the Oldest of the Oldest, the Ultimate Principle.

2. Creation, according to the Cabbala, is a process of emanation. There are 10 divine emanations, known as the 10 Sephiroth (lit., enumerations). The first four (as above set forth) are Breath, Breath of Breaths or Air, Water, Fire, one emanating from the other. Upon these four Sephiroth follow six directions of space—height, depth, east, west, south, and north. Besides being called Sephiroth, they are also designated as tools used by God at creation. Out of air the intelligence in the universe is formed; out of water, the material world; out of fire, the spiritual universe (angels and the divine throne). At this point, however, differences of opinion among Cabbalists and considerable confusion of ideas arise. It is not made clear whether these 10 Sephiroth represent real acts of creation or merely emanations by means of which His essence becomes clear to us; and,

again, it is uncertain whether the Sephiroth are independent beings intermediate between God and the material world, or merely manifestations of the Divine Being himself. The 10 Sephiroth in the developed Cabbala are denominated: (1) Crown, (2) Wisdom, (3) Intelligence, (4) Love, (5) Justice (also called Might and Fear), (6) Beauty (also called Mercy), (7) Victory, (8) Splendor, (9) Foundation, (10) Kingdom. These 10 Sephiroth are variously subdivided as Sephiroth of the world and Sephiroth of construction, or into three groups, as metaphysical, spiritual, and physical Sephiroth. The Sephiroth were commonly pictured by the Cabbalists under a human form, and the 10 emanations divided among his various organs and limbs, Crown representing the head, Wisdom the brain, and Intelligence the heart; while Love, Justice, and Beauty corresponded to the right arm, left arm, and breast respectively, with Victory, Splendor, and Foundation symbolized by the right and left thigh and the genital organs respectively. "Kingdom" rests under his feet, while God towers above his head.

3. There are two classes of Sephiroth: (a) Heavenly or Sephiroth of light; (b) Sephiroth of darkness and wickedness. The Sephiroth of darkness produce the evil demons, at the head of whom stands Samael. Through the demons the work of creation is constantly threatened with destruction.

4. The end of the powers of evil can be brought about through the triumph of morality and goodness among men; and that again is dependent upon the supremacy of the spirit of man over his desires. When the mind of man is in full control, the Messiah will appear and restore the world to its original perfect state.

5. Man himself is a type of a divine heavenly man known as Adam Kadmon. He represents in his person the whole scheme of creation and is therefore a microcosmos. All parts of the human body have therefore a symbolical significance.

6. As a means of penetrating into the divine secrets, writing was revealed, and hence words, letters, vowels, and accents all symbolize certain teachings, the secrets of which are revealed only to those who can penetrate beneath the surface. It is in the combination of letters and endless meanings attached to the numerical value of such combinations that Cabbalistic writers indulge, each one trying to outdo the other in mystical interpretations.

From this rapid survey it is evident that various factors are involved in Cabbalistic teachings. The theory of emanation that lies at the basis is an echo of the Idealistic philosophy of Plato, in combination with Neo-Platonism.

Christian Gnosticism represents a second factor that accounts for some of the mystical aspects of the Cabbala, while in its developed form traces of mystical ideas in Islam may be detected. The influence of Cabbalistic teachings on Judaism was fraught with serious consequences. It led to divisions, and to the formation of new sects, which shut themselves from the influence of culture and were hostile to reasoning that did not conform to Cabbalistic teaching; and when the Cabbala spread to the Christian world, its influence, though not so extensive, was most baneful, and checked for a time the progress of rational philosophic thought.

Bibliography. Latin translation of the *Sefer Jezirah*, with five commentaries (Mantua, 1562); German translation by Meyer (Leipzig, 1830); Eng. trans. by Kalisch (New York, 1877). Consult, also: Tholuck, *Wichtige Stellen des rabbinischen Buches Sohar* (Berlin, 1824); Joel, *Die Religionsphilosophie des Sohar* (Leipzig, 1849); Franck, *La Kabbale* (Paris, 1843); Jellinek, *Beiträge zur Geschichte der Kabbala* (Leipzig, 1851-52); Ginsburg, *The Kabbala* (London, 1865); Rubin, *Heidentum und Kabbala* (Vienna, 1893); id., "Kabbala," in Hamburger, *Realencyklopädie für Bibel und Talmud*, vol. ii (Strelitz, 1883); Bloch, "Die Jüdische Mystik und Kabbala," in Winter und Wünsche, *Jüdische Litteratur*, vol. iii (Trier, 1896); Wünsche, "Kabbala," in Herzog, *Realencyklopädie für protestantische Theologie und Kirche* (vol. ix, 2d ed., Leipzig, 1901); Graetz, *Geschichte der Juden von den ältesten Zeiten bis auf die Gegenwart* (Berlin and Leipzig, 1853-70); Jost, *Geschichte des Judentums und seiner Sekten* (Leipzig, 1857-59); Cassel, *Geschichte der jüdischen Litteratur* (Berlin, 1872-73); Ueberweg, *Grundriss der Geschichte der Philosophie* (8th ed., Berlin, 1896-97); Ritter, *Geschichte der Philosophie* (12 vols., Hamburg, 1829-53); Tennemann, *Geschichte der Philosophie* (11 vols., Leipzig, 1798-1819); Karppe, *Etudes sur les origines du Zohar* (1901); Ginzberg, "Cabala" in *The Jewish Encyclopædia* (1902); Waite, *Doctrines and Literature of the Cabbala* (1907); Neumark, *Geschichte der jüdischen Philosophie des Mittelalters*, vols. i (1907), ii (1910); Westcott, *Introduction to the Study of the Kabbalah* (London, 1910); Pick, *Cabbala: Its Influence* (Chicago, 1912); Bischoff, *Die Elemente der Kabbalah* (Berlin, 1913); Waite, *The Secret Doctrine in Israel* (London, 1913).

CABEZA DE VACA, kà-bà'sà dà vù'ká. See NÚÑEZ CABEZA DE VACA, ALVAR.

CABEIRI, or **CABI'RI** (Lat., Gk. Κάβειροι, *Kabeiroi*). Divinities worshiped anciently in many parts of the Greek world—in Lemnos, Imbros, Samothrace, and at certain points on the adjacent coasts of Europe and Asia Minor, as well as in a few other places, as at Thebes in Boeotia. The myth of the Cabeiri is obscure and variously given by different authors. In Lemnos they were represented as sons of Hephaestus, whose ministers they were and whom they assisted at his labors. Being by nature beneficent, they gave the Argonauts a kind welcome when the latter touched at the island. During the nine-day festival in their honor at Lemnos, all fires were extinguished; the needed fire was obtained from Delos. In 1888 excavations of a temple of the Cabeiri near Thebes in Boeotia, made by the Germans, threw light on the Boeotian cult of these deities. There one of the Cabeiri was identified with Demeter. In Samothrace they were honored as the protectors of sailors in time of peril. Their mysteries here attracted much attention, especially after the death of Alexander the Great, and initiation into them was eagerly coveted. The Cabeiri at Samothrace were associated with Hermes and seem to have given cattle fertility. The Grecian Cabeiri—two, three, or four in number—are said to have been worshiped by the early Pelasgian inhabitants of the Grecian islands and are to be distinguished from another group of eight (called *Kabirim*), which were of Phœnician origin. Among the later Greeks and the Romans the tendency was to identify the two sets, the

process of identification being assisted by the meaning of the word *Kabirim* (the strong, the powerful, the Greek Cabeiri being also called *θεοὶ μεγάλοι, δυνατοί, ισχυροί*). The Romans identified the Cabeiri with the three divinities worshipped in the temple of Capitoline Jupiter or with the Penates.

Consult: Lobeck, *Aglaophamus* (Königsberg, 1829); Schömann, *Griechische Altertümer*, vol. ii (Berlin, 1897); Preller, *Griechische Mythologie*, vol. i (Berlin, 1894); Welcker, *Griechische Götterlehre*, vols. i, iii (Göttingen, 1857-62); Lenormant, in Daremberg and Saglio, *Dictionnaire des antiquités*, vol. i (Paris, 1892); O. Rubensohn, *Die Mysterienheiligtümer in Eleusis und Samothrake* (1892); Robinson, "Greek Inscriptions from Sardis," in *American Journal of Archaeology*, 2d series, 17 (1913), 365 (for etymology).

CABELL, JAMES LAURENCE (1813-89). An American physician. He was born in Nelson Co., Va., graduated at the University of Virginia, studied medicine there, in Baltimore, Philadelphia, and Paris, and became professor of anatomy and surgery in the University of Virginia. He had charge of the Confederate military hospitals during the Civil War and subsequently was chairman of the National Sanitary Conference and president of the National Board of Health. He published *The Testimony of Modern Science to the Unity of Mankind* (1858).

CABER, TOSSING THE (Gael. *cabar*, pole). An athletic exercise or feat practiced wherever there are Scottish athletic contests. The trunk of a tree, or a beam heavier at one end than the other, is used. Competitions in which the powers of the opponents are unknown are generally started with a caber of 24 or 25 feet, from which the thick end is sawn off by degrees, until the proper length is reached. The usual size is 16 feet long, with ends of 5 and 11 inches diameter respectively. The caber is balanced by assistants perpendicularly, with its heavy end up. The tosser puts one foot against it, seizes it with both hands, and when the assistants let go, at his command, raises it until he can get his hands under the lower end, which he raises to about the level of his waist. With the caber leaning slightly against his shoulder he moves forward at increasing speed until ready to make the toss, when he stops and throws the caber upward and forward in such a manner that when the large end strikes the ground the small end will continue on in the line of the throw. In Scotland the contestant is declared the winner whose style is the best, and whose caber falls most nearly in a straight line away from him. In the Caledonian games played in America the distance only of the toss is taken into account.

CABES. See GABES.

CABESTAING, KÄ'BĒS-TÄN' (variously spelled), GUILLAUME DE (?-c.1213). A Provençal poet, of a noble Roussillonaise family. He was one of the knights who fought in 1212 in the celebrated battle of Las Navas, where the Christians defeated the Moors. It is said that he loved Marguerite, wife of Raymond of Chateau-Roussillon, and that the jealous husband killed the poet, tore out his heart, and, having it cooked, fed it to his wife. When she learned the truth, she exclaimed, "Now, since I have eaten such noble food, I shall never eat any other." Thereupon she threw herself from a balcony and died. This story belongs to the legend of the "eaten heart," which came from

India and is found in several Occidental literatures. It has been attributed also to a French trouvère, the Châtelain de Coucy, and to a German minnesinger, Reinmann von Brennenberg. The version here given is to be found in Boccaccio's *Decameron*, ninth tale of the fourth day. Some of Cabestaing's verses have been published in the collection of Raynourd. Consult the study by Hüffer (Berlin, 1869); E. Beschnitt, *Die Biographie des Troubadours Guilhem de Capestaing und ihr historischer Wert* (Marburg, 1879); G. Paris, *Le roman du châtelain de Coucy* (Paris, 1879).

CABET, KÄ'BÄ', ETIENNE (1788-1856). A French Communist, born Jan. 2, 1788, at Dijon. Cabet was a true product of the intellectual and social reconstruction of the era of the Revolution. He was educated as a lawyer, became an efficient government official as Procureur Général in Corsica, representing the government of Louis Philippe, after having headed an insurrectionary committee and participated actively in the July Revolution of 1830. In 1831 he took his seat with the extreme Radicals in the Chamber of Deputies as representative from Côte d'Or. On account of his radical doctrines he was prosecuted by consent of the Chamber, and condemned to two years' imprisonment, but was permitted to go into exile in England, where he came under the influence of the Owenite school of social reform, and finally accepted communism as the only solution of the problems presented by excessive wealth and excessive poverty side by side in modern society. He returned to France after the amnesty of 1839, and published under the pseudonym Francis Adams the *Voyages et aventures de lord Carisdall en Icarie* (1840), which he republished in 1842 over his own name. The work was a popular romance, setting forth his new communistic ideas, which won followers by the thousands and drove its author to take steps to realize his Utopia. In 1841 he revived the *Populaire* (originally founded by him in 1833), which was widely read by French workmen, and from 1843 to 1847 he printed an Icarian almanac, a number of controversial pamphlets, a book on Christianity (*Le vrai christianisme suivant Jésus Christ*), which makes out Christ's mission to be to establish social equality, and contrasts primitive Christianity with modern ecclesiasticism to the disparagement of the latter, and a popular history of the French Revolution from 1789 to 1830, in 5 vols. Cabet hoped to secure the support of the government for a communistic society to be established in France, but failing in this he turned his attention to America. In 1847 he purchased a tract of land in Texas, and 69 men entered into a social contract, making Cabet the director in chief for the first 10 years, and embarked from Havre, Feb. 3, 1848. The location proved unsuitable, and when Cabet set out for America, toward the end of the year, he found that the colonists had returned to New Orleans. Many of them decided to return to France; those who remained loyal followed Cabet to Nauvoo in Hancock Co., Ill., on a beautiful bend of the Mississippi River, where the Mormons had made a prosperous town before public opinion had driven them to Utah. After establishing his community Cabet returned to France, whence he was expelled in 1851 after the coup d'état. In 1852 he set out for Nauvoo. The community at Nauvoo prospered, but much discontent arose

under the somewhat arbitrary government of Cabet. In 1856 serious dissensions arose, and by a majority vote Cabet was deprived of the general directorship of the community. With the faithful minority, numbering about 180, Cabet retired to St. Louis, where he died Nov. 8, 1856, a broken-hearted and disappointed man. He was the inspirer of modern communism at its best, and a writer of more literary merit and moral worth than the calumny which contemporaneous writers in France succeeded in weaving about his name would lead us to believe. Consult Shaw, *Icaria: A Study in Communistic History* (New York, 1884); Lux, *Etienne Cabet und der ikarische Communismus* (Stuttgart, 1897); Prudhommeaux, *Icarie et son fondateur E. Cabet* (Paris, 1907). See COMMUNISM; ICARIANS.

CABINDA, ká-bên'dá, or **KABINDA**. A seaport town of Portuguese West Africa, situated in lat. 5° 30' S., and long. 12° 10' E., north of the estuary of the Congo (Map: Congo, etc., B 4). An active trade in sugar, cocoa, palm oil, and ground nuts is carried on by the British and German population. Since the introduction of a high tariff in Belgian Congo Cabinda has increased its commerce considerably. It was at one time a noted slave market. The name "Cabinda" is also applied to the entire portion of Portuguese West Africa situated north of the Congo. Pop., est. about 10,000.

CABINET (Fr. dim. of *cabane*, *cabine*, cabin, from Gael. and Irish *caban*, booth, hut, tent). Originally a small chamber set apart for some special purpose, such as private interviews, or study, or for collections of objects of art or curiosity. Sovereigns, ministers, and other high officials always had such cabinets in connection with larger reception rooms. The term then came to be applied to the closets or show cases in which the collections were kept in many such rooms, and even to the collections themselves. Cabinet collections are always supposed to be of small objects, and in this sense we speak of a cabinet picture. Cabinetwork is, by extension, the art of fine woodwork such as was used at one time largely in making the delicate decorative furniture for such rooms and collections.

CABINET (originally the closet or private apartment of a monarch, in which he consults with his most trusted advisers; hence, sometimes as a term of contempt, those who frequent the king's closet). The collective body of official advisers of the executive head of the state. In modern times the term is usually limited to the ministers, or heads of the great departments of state, in a constitutional government, but there is no reason for restricting it to such heads of departments, nor in refusing the title to the chosen advisers of an absolute monarch. The powers and functions of cabinets vary greatly, even in modern constitutional states.

In England the cabinet is virtually a committee of the House of Commons, and it constitutes the supreme executive authority of the realm. In the United States the term is applied to the group of executive heads of the Federal government, who have no authority outside of their several departments, and whose function as cabinet ministers is purely an advisory one. The cabinets of the two countries are alike in this respect, however, that they are composed exclusively of members of the dominant political party—a result insured in England by the fact that the cabinet, being a committee of the

legislature, is dependent on a party majority for its continuance in office, and in the United States by the assumed obligation of the President to appoint only members of his own political party to the chief offices of the State. In the constitutional governments of the continent of Europe and in Japan, as well as in the self-governing British colonies, the model of the English cabinet has usually been followed. There being in those countries, with the exception of France and Switzerland, no opportunity for the popular will to express itself directly in the choice of the chief executive, popular government is conceived of as signifying parliamentary government, and the attempt is made, with varying degrees of success, to secure to the legislature a substantial measure of executive power through a responsible cabinet, subject to its control. It is only in Great Britain that this transfer of executive power from the titular head of the state to the legislature has become complete, and that we find *cabinet government* in its most highly developed form. In France, however, it is practiced with a large measure of success and is completely accepted in theory, whereas, in most of the continental states which have adopted the device of the parliamentary cabinet, it is still imperfectly accepted and applied.

France is the only important instance of the adoption of cabinet government by a republic. In the states in which the popular will finds expression in the choice of the head of the state, it has not usually been deemed necessary to deprive that head of his executive authority, nor to set up a competing executive, deriving its authority less directly from the people. Hence in Switzerland and the republics of the Western World, the American model—a cabinet responsible not to the legislature, but to the President or Governor—has been adopted. In this system the cabinet, as a body, has no official existence, the persons composing it being individually, and not collectively, responsible to the head of the state, and usually holding their offices as well as their advisory relation to him subject to his will. In the Federal government of the United States this relation is clearly indicated in the phrase "the President's cabinet," by which his official advisers are commonly referred to. Accordingly, the dismissal of a cabinet minister, or even of the whole cabinet, may be effected without altering the political complexion or the policy of the administration; whereas, under the English system, the cabinet is "the government," its members stand or fall together, and its dismissal involves, in the full sense of the phrase, a change of government.

The advantages and disadvantages of these two contrasting forms of popular government are elsewhere set forth (see GOVERNMENT; PARLIAMENT), but the fact should here be noticed that a cabinet representing the legislature and responsible to it is necessarily deeply concerned in the legislative as well as in the executive business of the state. The British ministry, representing the dominant political party in Parliament, has assumed complete control of legislation; and this, it is conceived, must always be the tendency of an executive so constituted and so related to the legislating body, whereas a cabinet of the American type (even when made up, as it usually is, of party leaders), having no official relation to the legislative branch of the government, is strictly confined

to its executive functions. In some of the foreign states which have adopted the American form of executive, the members of the cabinet have a place—for purposes of discussion if not of voting—in the legislature; but in the United States the fear of impairing the mutual independence of the legislative and the executive departments of the government has caused a similar tendency to be successfully resisted.

The President's Cabinet.—The Constitution of the United States made no provision for the creation of executive departments, but vested the sole executive power in the President. The several executive departments through which the President exercises this power have been created by successive acts of Congress, under the authority conferred by Art. I, Sec. 8, par. 18, of the Constitution, authorizing the Congress "to make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this Constitution in the Government of the United States, or in any department or officer thereof." At the first session of Congress, in 1789, the departments of State (first called Foreign Affairs), of the Treasury, and of War (which included naval as well as military affairs) were established; and the heads of these departments (called Secretaries of State, War, and the Treasury, respectively), together with the Attorney-General, who was then a part of the judicial establishment, constituted the first President's cabinet. The office of Postmaster-General, created upon the organization of the post-office system in 1794, was not deemed of sufficient importance and dignity to entitle its incumbent to a seat in the President's councils; in 1829 the Postmaster-Generalship became a cabinet office. In the meantime the Navy Department had been set apart from that of War, and the Secretary of the Navy created a cabinet officer, in 1798. In 1849 the Department of Internal Affairs was set apart from the Department of State, and the office of Secretary of the Interior created. In 1889 the Department of Agriculture was established, and its head, the Secretary of Agriculture, added to the list of cabinet officers. In 1903 the Department of Commerce and Labor was created, the Secretary of Commerce and Labor being made a cabinet officer. This department was divided by law of 1913 into the Department of Commerce and the Department of Labor, each with a cabinet officer at its head.

It is obvious that there is no natural order of precedence among the chiefs of the great executive departments of the government, and prior to 1886 there was no legal discrimination between them. But in that year the succession of the members of the cabinet to the presidential office, in the event of the death or disability of both the President and Vice President, was established by act of Congress, in the order in which they are named above. Even under this statute, however, there is no justification for the journalistic practice of referring to the Secretary of State as the "premier" of the administration, there being no analogy between his position and that of the Prime Minister in a cabinet of the English model. The President's cabinet, therefore, consists of his officers of administration, whom he calls into consultation when he desires their advice. They hold their meetings in a room in his official residence, no record is kept of their proceedings, and he is not bound to heed their advice.

The British Cabinet.—There is a curious lack of correspondence between the legal and actual functions of the cabinet in the government of Great Britain. Legally it is merely a committee of the Privy Council, originally chosen by the King for advice "in his most secret affairs." Actually it is, as has been said, the executive committee of the House of Commons, entirely independent of the crown and of the Privy Council, and wielding the supreme authority of Parliament in the administration of the state. It has had a long and varied history. Prior to 1782 is contained honorary or "nonefficient," as well as active and "efficient" members. Since that date it has been made up exclusively "of the persons whose responsible situations in office require their being members of it." The number of these may vary somewhat, but modern usage has fixed the number at not less than 11. These are usually the First Lord of the Treasury, the Lord Chancellor, the Lord President of the (Privy) Council, the Lord Privy Seal, the Chancellor of the Exchequer, the First Lord of the Admiralty, and the five principal Secretaries of State, viz., for Home Affairs, for Foreign Affairs, for the Colonies, for India, and for War. To these may be added the Chief Secretary for Ireland, the Chancellor of the Duchy of Lancaster, the Postmaster-General, the President of the Board of Trade, and one or two other high officials, but the tendency at present is to limit the number to the principal officers of state above enumerated. All of these officers of the government are appointed on the recommendation of the Prime Minister, who makes up his cabinet from among them, and who may or may not hold one or more of those offices himself. He presides at meetings of the cabinet, but his pre-eminence gives him no legal control over that body or over its individual members. Its deliberations are secret, and it always acts as a unit, the defection of a member involving his retirement from the cabinet and from the office held by him. All of its members are also members of one or the other of the houses of Parliament and take part in the proceedings of that house.

The term "cabinet" is sometimes applied, by courtesy, in the United States, to the principal officials of a State government, who may be called together by the Governor to advise him on questions of policy, and sometimes, in the same sense, the chief executive officers of a municipal government are called a "mayor's cabinet."

The literature of the subject is very extensive and will be found more fully referred to under the general heads of GOVERNMENT and PARLIAMENT. The historical evolution of the British cabinet and its relation to Parliament and the crown are fully set forth in Anson, *The Law and Custom of the Constitution* (Oxford, 1892); and in Todd, *On Parliamentary Government in England* (2d ed., London, 1887). The best brief account of the operation of the British Cabinet system is to be found in Lowell, *The Government of England* (New York, 1908). Interesting comparisons of the British and American systems of cabinet government are to be found in Bagehot, *The English Constitution* (London and Boston, 1873), and Bryce, *The American Commonwealth* (3d ed., London and New York, 1900). Consult also Blauvelt, *Development of Cabinet Government in England* (New York, 1902); Hinsdale, *History of the President's Cabinet* (Ann Arbor, Mich., 1911); Learned, *President's Cabinet* (New Haven, 1912).

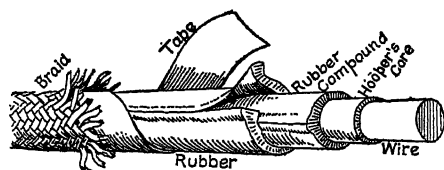
CABINETWORK, CABINETMAKING. The art and craft of fine woodwork. In English usage the term is confined to the making of fixed and movable furniture: choir stalls, pulpits, organ cases, tables, chairs, and fine chests are all alike examples of cabinetwork. In the United States the term is often extended to include joinery (q.v.), i.e., the finer woodwork in buildings, ships, and railway cars, such as wainscoting, the finer sort of door trim and window trim, and all woodwork requiring special care in the making, putting together, and finishing. The cabinetmaker works chiefly with the harder woods, such as oak, walnut, mahogany, etc.; and his work is distinguished from the coarser work of the carpenter not only by its finer quality, but by its use of careful framing together with panels, dovetailing, mortising, and gluing instead of the rougher nailing and butt-jointing common in carpentry. In the finer cabinetwork, besides the ordinary operations of forming the pieces and putting them together, there are included the operations of sandpapering, staining, filling, varnishing, and polishing, and often also inlaying, marquetry, and carving. See BOULE.

CABIRI. See CABEIRI.

CABLE (OF., LL. *capulum*, a strong [holding] rope, from Lat. *capere*, to take, hold). A strong chain or rope used to hold a ship to her anchor. Practically all cables are now made of chain, only very small craft using rope. See ANCHOR; CHAIN.

CABLE, ELECTRIC. Strictly speaking, a combination of two or more separately insulated electric conductors with a protective covering or armor. Popular usage sanctions the extension of the term "electric cable" to simple insulated and armored wires and to ropes of twisted wires without either insulation or armor. Retaining for the present the limited definition first given, an electric cable may be described as consisting structurally of, first, the conducting wires or core; second, the insulating material separating the several wires; and, third, the protective covering or armor. Cables may be aerial, submarine, or underground, depending on their position; classed according to their uses they are telegraph, telephone, electric light, and power cables, and as to the arrangement of their conductors they are straightway or twisted. Cables for different purposes differ somewhat in the details of their construction, but their general construction is substantially similar, and the following description of underground cables for electric lighting will answer for cables for other purposes, with such exceptions as will be noted farther on. Electric light cables for use underground are of two classes, according as the insulation is or is not moisture proof. In the first class the insulation is rubber or bitumen and the lead covering is for protection from mechanical injuries only. The second class is insulated with jute, hemp, or paper impregnated with oil, wax, or resinous compound, and the lead covering for this cable is absolutely necessary on account of the hygroscopic nature of the insulation. The manufacture of a cable of the first class may be described briefly as follows: To insulate the conductor it is first wrapped around with one or more layers of pure rubber tape put on spirally, the direction of the spiral being reversed for each successive layer. On top of this rubber compound is applied in two or more separate coatings, each coat being put on

by pressing the partially formed cable with two strips of rubber compound, one above and one below it, between a pair of rollers which fold each strip half around the cable and press the edges of the two strips together so as to make a good joint along each side. When a sufficient number of layers of rubber compound have been put on to give the requisite thickness, the core is tightly bound in a spiral wrapping of prepared rubber tape and then vulcanized. After this the cable is tested to determine the efficiency of its insulation. If this test is satisfactory, the cable is taken to the taping and braiding machine, where the external covering of tapes and braiding is put on. The next step is to armor the cable with lead. This may be done by drawing the cable into a lead tube, which is then drawn through a die and made to fit the core tightly: or the last cover may be put on in a hydraulic press, the hot lead being forced



AN UNDERGROUND CABLE FOR ELECTRIC LIGHTING.

out through an annular die around the cable. The accompanying sketch shows the make-up of an electric light underground cable before it is armored. Of cables of the second class the Siemens cable and the paper cable are representative examples. In the Siemens cable the conductor is wrapped with jute and impregnated with a special bituminous compound mixed with heavy oil, and is then covered with lead. Paper cable consists of paper wound on in strips spirally over the conductor, and as each strip is applied the whole is passed through a die which presses it into a compact mass. The core is then dried at a temperature of 250° F., to expel the moisture from the paper, and immersed in a bath of specially prepared compound, from which it passes directly to the lead-covering press.

The standard type of cable for telephone work consists of 400 insulated wires twisted in pairs with about three-inch lay; and the pairs are cabled in reverse layers, forming a cable about two inches in diameter. The 200-pair cable is used for main routes, but 100-pair, 50-pair, and smaller cables are used for distribution. The insulation consists of dry paper wound loosely on the wire, and the whole is armored with lead pipe. Submarine cables for telegraph and telephone lines are much like the underground cables of the first class for electric lighting, but are commonly armored with strands of iron wire. (See TELEGRAPHY, SUBMARINE.) Aerial cables for long-distance power transmission are commonly neither insulated nor armored. For example, the aluminium cable for the 181-mile transmission line of the Bay Counties Power Company, in California, is seven-eighths of an inch in outside diameter and consists of 37 aluminium wires twisted into a rope without insulation or armor. These cables carry a current at 40,000 volts. Aerial cables for local distribution are usually insulated. This insulation is usually in two parts: one of insulating material impervious to moisture, placed next to the wire, and the other of some substance which

resists abrasion or other mechanical injury. In the most expensive grades of wire more than two coatings are employed. Various special cables are employed. For example, there is in use in New York City a three-conductor cable for transmitting three-phase lighting current from the main stations to substations. This cable may be broadly described as consisting of three separate insulated cables of 37 wires, twisted together with the spaces filled with jute and the whole first insulated and then armored with lead pipe. Concentric cables are another special form. They consist first of one wire core of twisted wires, second a thick layer of insulation, third a layer of spirally wound wire or wire strands, fourth a layer of insulation, and fifth a protective coating or armor. See TELEGRAPHY, SUBMARINE. Consult the sections relating to electric cable construction to be found in Crocker, *Electric Lighting*, vol. ii (New York, 1906); Foster, *Electrical Engineer's Pocket-Book* (New York, 1910); Perrine, *Conductors for Electrical Distribution* (New York, 1903); Telmar, *Electric Power Conductors* (New York, 1909); *Standard Handbook for Electrical Engineers* (New York, 1912).

CABLE, SUBMARINE. See ATLANTIC TELEGRAPH; TELEGRAPHY, SUBMARINE.

CABLE, GEORGE WASHINGTON (1844-1925). An American novelist and writer on social questions. He was born in New Orleans, Oct. 12, 1844. On his father's side he is of Virginia stock and on his mother's side of New England ancestry. After scant schooling Cable became a clerk in New Orleans, and in 1863 entered the Confederate army, where he served in the Fourth Mississippi Cavalry. At the close of the war he became a civil engineer, but malarial fever drove him back to mercantile life and he was employed as accountant in a firm of cotton factors till 1879. During this period he wrote for the New Orleans *Picayune*, under the pseudonym of Drop Shot, and it was at this date that he published his first volume of fiction, *Old Creole Days*, a collection of short stories dealing with the then unexploited types of social life in New Orleans and Louisiana. This was followed by *The Grandissimes* (1880), which is probably his best work; *Madame Delphine* (1881); *Dr. Sevier* (1883); *Bonaventure* (1888); *Strange, True Stories of Louisiana* (1889); and, less valuable and interesting, *John March, Southerner* (1894). These constitute an original and unique body of fiction. His most recent novels are: *Strong Hearts* (1899); *The Cavalier* (1901); *Bylow Hill* (1902); *Kincaid's Battery* (1908); *Posson Jones and Pere Raphael* (1909). Cable is less popularly known in his more expository books, *The Creoles of Louisiana* (1884), *The Silent South* (1885), *The Negro Question* (1890). In 1885 Cable removed to New England, living first at Simsbury, Conn., and later at Northampton, Mass. (1886). The value of Cable's best work is recognized by all students and critics of American literature, and appreciations of his work are to be found in contemporary reviews. He was elected to the American Academy of Arts and Letters.

CABLE LETTERS. See ATLANTIC TELEGRAPH.

CABLE MOLDING. In architecture, a molding cut in the form of a rope, the twisting being prominently shown. It was much used in later Norman work.

CABLEWAY. A hoisting and conveying de-

vice, employing a suspended cable as a trackway, and differing from ropeways (q.v.), which cannot be used for hoisting, being limited to the sole function of conveying. While ropeways date back to the early part of the nineteenth century, the cableway had its origin practically in an inclined hoisting and conveying device invented about 1860, and still extensively used in the slate quarries of Vermont and Pennsylvania. These first cableways consisted of a winding engine with one drum, a suspended cable, a cable carriage traveling on the suspended cable, a fall block adapted to rise and fall from the cable carriage, and a hoisting rope operating the same. The suspended cable or track cable of these cableways ran on an incline from the top of a trestle tower to a ground anchor. Horizontal cableways of short span were used in the construction of the piers of the St. Louis Bridge. As the span of cableways became greater, the necessity arose of supporting the hoisting rope or fall rope between the tower and the carriage. The devices for supporting the fall rope are termed fall-rope carriers. One of the earliest arrangements of this sort consisted of a series of blocks, at the upper end of each of which was a sheave riding on the track cable and through the lower end of which was a hole for the fall rope. These blocks were connected by a light chain, one end of which was also connected to the head tower and the other end to the carriage; as the carriage moved out from the head tower, it strung the blocks at intervals along the track cable, and as the fall rope passed through a hole in each block it was supported and prevented from sagging unduly; as the carriage returned to the tower it gathered up the blocks into a bunch at the tower. This system of fall-rope carriers was objectionable chiefly because of the weight of the connecting chain, and although it is still used in its essential features, the heavy chains have been replaced by light steel wire connections and other important reductions made in the weight.

A second form of fall-rope carrier arrangement much used may be described as follows: an auxiliary rope is suspended above the main cable and held in a parallel position to the main cable by passing under wheels in the cable carriage. On this rope a series of buttons are secured whose diameter increases with the distance from the head tower; slots in the heads of the carriers, corresponding to the diameter of the buttons, allow each of the carriers in passing out from the head tower to be stopped at its proper button. The carriage distributes and picks up the carriers in its forward and return journeys.

Described briefly, the modern cableway consists of a heavy steel cable, called a track cable or main cable, suspended with a slight sag between the tops of two timber towers so placed that the main cable spans the quarry, canal, foundation pit, or other work on which it is to be used. On this main cable a carriage runs, being drawn back and forth by an endless rope passing around suitable sheaves at the tower tops and operated by a special hoisting engine mounted at the bottom of one of the towers. From the same engine a hoisting or fall rope passes to the top of the engine tower and thence through the fall-rope carriers to the carriage, where it connects with a fall block by means of which the load is hoisted. The fall-rope carriers have already been described. The operation of the cableway is as follows: the carriage is run

out on the main cable to a point directly over the place from which the load is to be picked up; the fall block is then lowered by running out the fall rope, and when it reaches the ground the load is attached; the fall rope is then hauled in, raising the load high enough to clear obstructions, and, finally, the carriage is hauled to the point of the main cable directly over the place where the load is to be deposited, and the fall rope then runs out, lowering the load to the ground. In work such as canal excavation, for example, where the purpose is simply to hoist the load of earth or rock, convey it to the bank, and deposit it as quickly as possible, the discharge of the load is effected in mid-air by special mechanism. In other cases the towers carrying the cables are mounted on wheels so that the whole cableway plant may be moved easily from one position to another.

The traveling cableway is particularly adapted to canal work, where the towers are placed on opposite banks, with the cables spanning the channel, and are moved along the banks as the excavation progresses. Cableways are built of varying capacities and lengths of span, depending in each case upon the work which they are required to perform. They are sometimes, though seldom, used for passenger traffic. Mr. Spencer Miller, the inventor of the Miller cableway, places the following limitations on the practical applications of cableways: span (single), 2000 feet; load, 25 tons; speed of travel, 1800 feet per minute; and speed of hoist, 900 feet per minute. The average practice, however, is about as follows: span, 600 to 1200 feet; loads, 3 to 7 tons; speed of travel, 500 to 1000 feet per minute; speed of hoist, 150 to 300 feet per minute. The files of the engineering journals and the excellent printed matter prepared by manufacturers of cableways should be consulted for further information on this subject.

CABLING. The cylindrical molding by which the hollows in the flutes of columns and pilasters are sometimes partially filled, though seldom beyond the third part of the height from the base.

CABOCHED, *kā-bōsh't'*, or **CABOSHED** (OF. *caboché*, It. *capocchia*, knob, from *capo*, Lat. *caput*, head). An heraldic term denoting the head of an animal, borne without any part of the neck, and exhibited full face.

CABOCHIENS, *kā'bō'shyān'*. A political faction in Paris, in the reign of Charles VII, named from one of the leaders, Simon Caboché. It comprised a large number of members of the butchers' trade and was organized in the years 1411-13 to obtain reforms from the royal government and to aid the party of Burgundy against the Armagnacs. Many government officials sympathized with the Cabochiens. They became quite powerful by the year 1413, organizing the Paris militia, exercising a general supervision of trade, and by a series of riots in the same year forcing Charles VII to recognize their demands by letters patent. As a result, the Cabochiens reformed the whole royal administration; but a reaction occurred, the Armagnacs gained the upper hand, the Duke of Burgundy fled from Paris, and the fortunes of the Cabochiens waned. In 1416 the guild of butchers was abolished and their privileges annulled. Consult Colville, *Les Cabochiens et l'ordonnance de 1413* (Paris, 1888); Lavissee, *Histoire de France*, vol. iv, part i, pp. 343-352 (Paris, 1902).

CABOOL, *kā-bōol'*. See **KABUL**.

CABO ROJO, *kā'bō rō'hō*, or **CAPE TOWN**.

A town of Porto Rico in the municipality of the same name, on the west coast, 6 miles west of San German (Map: Porto Rico, A 3). It contains public schools, a theatre, Masonic temple, hospital, and church. The chief industry is the exportation of salt gathered from deposits on the near-by shore. Pop., 1899, 2744; 1910, 3847. Cabo Rojo was founded in 1774.

CABOT, *kāb'ot*, **GEORGE** (1751-1823). An American politician. He was born in Salem, Mass.; studied for two years at Harvard College, and then went to sea and became a captain before reaching his majority. He was chosen to the Massachusetts Provincial Congress in 1776, was also a member of the State Constitutional Convention, and was United States Senator from 1791 to 1796. When the office of Secretary of the Navy was created, in 1798, he was appointed to it by President Adams, but he declined to serve, though he actually held the office for a month and thus became the first head of the Navy Department. In 1814 he was elected president of the famous Hartford Convention (q.v.). It was Cabot who introduced the Fugitive Slave Act of 1793 into the United States Senate. Consult Henry Cabot Lodge, *Life and Letters of George Cabot* (Boston, 1877).

CABOT, **JOHN** (1450-98). An Italian navigator sailing under the English flag. His native name was Giovanni Caboto, and he was born in Genoa. He removed to Venice at an early age, acquired citizenship there, and traded thence to all the important Mediterranean ports. About 1490 he removed to England and settled in Bristol. On March 5, 1496, he secured from King Henry VII letters patent authorizing him to take possession of any lands he might discover. He sailed in May, 1497, and on June 24, after a rough passage, landed on the North American coast, probably near Cape Breton. He returned to England, where he landed on August 6, and was rewarded by the King with the post of great admiral. He began immediately to prepare for a second voyage, with the purpose of exploring and colonizing the new-found land. Several Bristol merchants coöperated to fit out a fleet, equipped with everything needed for the complete exploitation of a new country. Cabot set sail with five vessels in the spring of 1498. One of the ships put back and landed on the Irish coast, whence the crew returned to England with the news that the fleet had run into a severe storm, which had forced them to make for land. From this point there is a decided difference of opinion among scholars. Some claim that Cabot with his entire fleet was lost and that the discoveries attributed to him on this voyage should be credited to his son Sebastian. But the evidence is quite conclusive now that John Cabot returned to England in the autumn of 1498. If so, the story of his voyage must stand. He sailed directly to Greenland, and after exploring both the east and west shores he headed south and skirted the coast as far south as the thirty-eighth parallel.

The most useful book on the Cabots for the general reader is Beazley, *John and Sebastian Cabot* (New York, 1898). Also consult Henry Harris, *Jean et Sébastien Cabot* (Paris, 1882). There is an English translation of this (see **CABOT, SEBASTIAN**), but it is not so complete as the original.

CABOT, **RICHARD CLARKE** (1868-). An

American physician, born at Brookline, Mass., and a graduate of Harvard College and Harvard Medical School. He became visiting physician to Channing House in 1895, and physician to out-patients of the Massachusetts General Hospital in 1898, and after serving as an assistant (1899-1903) and as instructor in medicine (1903-08) at Harvard Medical School, he was, in 1908, appointed assistant professor. His publications include: *Clinical Examination of the Blood* (1896; 5th ed., 1904); *Serum Diagnosis of Disease* (1899); *Physical Diagnosis* (1901; 5th ed., 1912); *Case Teaching in Medicine* (1906); *Social Service and the Art of Healing* (1909); *Differential Diagnosis* (1911; 2d ed., 1912); *Christian Approach to Morality* (1913); *What Men Live By* (1914).

CABOT, SEBASTIAN (1475-1557). An English navigator, born in Venice. He was one of the three sons of John Cabot, his brothers being Lewis and Santius. There is no contemporary evidence that Sebastian accompanied his father on either of the two voyages to America, in 1497 or 1498. After his father's death Sebastian took up the profession of navigation. He was also a cartographer of some repute, being employed to prepare the maps for an English military expedition to southwestern France (1512). He accompanied the English forces, and while away was induced to enter the service of the King of Spain. He soon rose to an influential position as the head of the Spanish navigation office, with the title of pilot major, a post he held for 30 years. There is some evidence, however, that in 1517 or 1518 he led an English expedition in search of a northwest passage to Cathay. In 1526 Charles V gave him the command of an expedition which was intended by its promoters to pass through the Strait of Magellan and trade in the Spice Islands. Acting probably under secret orders from the King, Cabot entered the estuary of the river which he afterward named La Plata, in the hope of finding another passage through to the Pacific. Misled by the stories which he had heard from the Indians, who told him that silver and gold (really to be found in Peru) were to be had at the headwaters of this river, he spent three years in trying to reach these sources of wealth. As a result the undertaking turned out a ruinous failure, and Cabot, after his return to Spain in 1530, was tried and found legally culpable for the disaster. The King, however, pardoned him and restored him to his office as pilot major. In 1548 Cabot went back to England and accepted a pension from the government of Edward VI for his services as great pilot. He became governor of the Company of Merchant Adventurers and was a prime mover in organizing and equipping the expedition of Willoughby and Chancellor to Asia by the northeast sea route in 1553, and that of Stephen Burrough by the same route in 1556. He died in the winter of 1557-58. The character of Sebastian Cabot has been variously estimated. English writers, supposing him to have been born in Bristol, eulogize his every trait and action. Consult Nicholls, *Remarkable Life of Sebastian Cabot* (London, 1869). In reaction against this view, consult Henry Harrisse, *John Cabot and his Son Sebastian* (London, 1896), than whom there is no more learned authority, and who describes him as a renegade and traitor, an unfilial boaster, without a single redeeming quality. The truth is presumably midway between these two extremes. Consult

Winship, *Cabot Bibliography* (London, 1900); Beazley, *John and Sebastian Cabot* (New York, 1898).

CABRA, kă'bră (anciently, *Aegabro*; Sp. *cabra*, Lat. *capra*, goat). A town of Spain in the Province of Córdoba, situated on the north slope of the Sierra de Cabra, 37 miles southeast of Córdoba (Map: Spain, C 4). It is one of the oldest cities in Spain and was one of the first to receive Christianity. It was an episcopal see as early as the fourth century. Its history is long and interesting. Ferdinand III delivered it from the Moors in 1240; later it was entrusted to the Order of Calatrava, was reconquered by the Moorish King of Granada in 1331, and in the next century was definitively won by the Christians. In 1445 Enrique IV gave the title of Count of Cabra to Diego Fernández de Córdoba, which title passed later to the house of Sessa. The city contains an old Moorish mosque, now a church, several monasteries, and a theatre. One of its schools, the *Colegio de Humanidades*, formerly enjoyed a considerable reputation. Cabra was the birthplace of Juan Valera, the most eminent man of letters produced by Spain in the nineteenth century. Pop., 1897, 12,863; 1900, 13,127; 1910, 12,181.

CABRAL, kă-bră'l, or **CABRERA**, kă-bră'ră, PEDRO ALVAREZ (?1460-1526). A Portuguese navigator. Concerning his private life we have but few details. We know only that he was the third son of Portuguese nobles, Fernão Cabral and Isabel de Gouvea, that his father was *adiantado* of the Province of Beira, Lord of Azurara, and *alcaide-môr* of the city of Belmonte, and that he himself married Isabel de Castro, who belonged to one of the noblest families in Portugal. His public life, as far as known, was limited to the brief period, 1500-01, when he was in charge of a fleet fitted out by King Emmanuel, destined for the East Indies. With 13 vessels, officered and manned by numerous and experienced seamen and soldiers, Cabral left Lisbon on March 9, 1500, intending to follow the route previously taken by Vasco da Gama, by way of the Cape of Good Hope. Either to avoid storms or calms, he took a course west of that of Vasco da Gama and was carried to the coast of Brazil by the strong southern equatorial current. Pinzon had touched on the northeastern coast of Brazil in the very beginning of the same year, somewhat north of where Cabral landed. Pinzon, however, did not seem to recognize the significance of his discovery, and Cabral regarded the coast as part of the Eastern Hemisphere, the non-Christian portions of which had been assigned to Portugal. He accordingly "took possession" in the name of the Portuguese King, calling the country *Terra Sanctæ Crucis*. Had Columbus failed in his original enterprise, the New World would not long have remained unknown to Europe, for the Portuguese followed up this accidental discovery of Brazil and would in this way have opened up the Western Continent. Leaving Brazil, Cabral sailed eastward to India, making important discoveries on the way, but losing five of his vessels in the storms he encountered. He founded a trading post at Calicut and concluded the first commercial treaty of Portugal in India. On his return to Portugal, he took with him ambassadors from the various countries over which he had unfurled the Portuguese flag. Despite this, and his having discovered Brazil, he was for some reason, probably the heavy loss of his ships, not

retained in service and sinks again into obscurity. "This adventure of Cabral's had interesting consequences. It set in motion the train of events which ended, after some years, in placing the name 'America' upon the map." Consult: Fiske, *Discovery of America*, vol. ii (Boston, 1892); Capistrano de Abreu, *Descobrimento do Brasil* (Rio de Janeiro, 1883); Varnhagen, *Historia geral do Brazil* (2d ed., 2 vols.).

CABRERA, ká-brá'rà (anciently, Lat. *Capraria*, goat island, from *caper*, *capra*, goat). One of the Balearic Islands (q.v.), situated about 10 miles south of Majorca (Map: Spain, G 3). It is about 3 miles in length and breadth, with an irregular coast. Fishing is the chief industry. Its permanent population amounts to only a few hundred. During the war in the Peninsula Cabrera formed a Spanish depot for French prisoners, who were crowded by thousands into the desolate spot and treated with great barbarity.

CABRERA, RAMÓN (1806-77), COUNT OF MORELLA. A leader of the Carlist party in Spain, born at Tortosa, in Catalonia. At the outbreak of the civil war following on the death of Ferdinand VII, in 1833, Cabrera joined the Carlists (q.v.) and soon rose to a high command. Such was his reputation for cruelty that the government seized his aged mother as a hostage. Cabrera, enraged, shot several mayors and officers of the government supporters. Thereupon General Noguera made the mistake of causing Cabrera's mother to be shot. This sent Cabrera upon a policy of reprisals so pitiless that he was soon nicknamed "The Tiger of the Maestrazgo." He shot, to avenge his mother's death, 1100 prisoners of war, 100 officers, many civilians, and the wives of four of the leading supporters of the queens Christina and Isabella. After penetrating as far south as Andalusia, his forces were completely routed by the royal troops on the borders of Aragon, and he himself, severely wounded, escaped with difficulty. He soon reappeared at the head of 10,000 foot and 1600 horse. Invading the Province of Valencia, he overthrew the royal army at Buñol (Feb. 18, 1837), and again, on March 19, at Burjasot; but was in turn vanquished at Torre Blanca, and once more compelled to seek a hiding place, but only to reappear soon after. Madrid itself was threatened by Cabrera, who about this time received from Don Carlos the title of Count of Morella for his vigorous defense of the fortress of that name and was also appointed Governor-General of Aragon, Valencia, and Murcia. The Carlists now believed that the triumph of absolutism was approaching, when the treachery of the Carlist general Maroto changed the whole aspect of affairs, and Don Carlos fled from Spain. Cabrera held out until, hemmed in by Espartero, he was forced to quit the country, July, 1840. He then entered France, where he was taken prisoner and confined for a short time in the fortress of Ham. In 1845, when Don Carlos renounced his rights to the throne in favor of his son, Count Montemolin, Cabrera accompanied the latter to England. On the outbreak of the French revolution in 1848 he renewed the struggle on behalf of absolutism in Spain, but the adventure proved a miserable failure, and after the encounter of Pasteral, Jan. 27, 1849, he recrossed the Pyrenees, to live in retirement. He afterward married an English lady, Miss Marianne Catherine Richards. When Alphonse XII was proclaimed King of Spain, in 1875, Cabrera advised the Carlists to submit to

him, chiefly because he was "a good son of the Church." He died May 24, 1877. Consult: Valras, *Don Carlos VII et l'Espagne carliste* (Paris, 1876); Arjona, *Pages d'histoire du parti carliste: Charles VII et Ramón Cabrera*, translated from the Spanish (Paris, 1875); Diaz and Cardenas, *Galeria de Españoles célebres contemporáneos*, vol. i (Madrid, 1841); Valle-Inclán, *La guerra carlista* (Madrid, 1908).

CABRERA BOBADILLA CERDA Y MENDOZA, bō'bá-dē'lyá thār'dá ē mán-dō'thá. LUIS GERÓNIMO FERNANDEZ DE (c.1590-1647). A Spanish administrator, born in Madrid. From 1629 to 1639 he was Viceroy of Peru. His administration was at the outset rendered difficult by the constant clamor for money on the part of the royal treasury. Spanish cruelty aroused among the Uru Indians of the Lake of Titicaca an insurrection which in 1632-34 he arduously suppressed. It was during his viceroyalty that discovery was made of the febrifuge properties of cinchona bark, and that the third navigation of the Amazon was accomplished.

CABRERA É IBARS, ká-brá'rà ā ē-bārs', JUAN BAUTISTA (1837-1916). A Spanish prelate, poet, and orator. He was born April 23, 1837, at Benisa, Province of Alicante, Kingdom of Valencia. After primary studies at Benisa, he began (1850) the humanities in the Institute of Valencia, and entering the Escolapian Order, for six years studied in its schools. From 1858 to 1863 he taught in the Pietist schools of Valencia and Gandia and was ordained deacon and presbyter. A detailed study of the Bible gradually changed his religious convictions so that he could no longer consider himself in harmony with the teachings of the Roman Catholic church. As there was no religious liberty in Spain at that time, Cabrera, fearing imprisonment, voluntarily exiled himself to Gibraltar in 1863. Here he remained for five years, studying religious works and ultimately professing publicly evangelical truth. Under authorization from General Prim, at the end of the revolution that expelled Isabella II (1868), he reentered Spain, began preaching in Seville, was able (1869) to open the first Protestant chapel in Spain, and in 1874 took charge of a chapel in Madrid. The Spanish Reformed church (q.v.) was formed in 1880, and Cabrera was elected Bishop. He was consecrated in 1894 by three prelates of the Irish church. His principal works are: *El Celibato forzoso del Clero* (Sevilla, 1870); *Catecismo de Doctrina y Vida Cristiana* (Madrid, 1887); *Manual de Doctrina y Controversia Cristiana* (2 vols., Madrid, 1900); *Poesías Religiosas y Morales* (Madrid, 1904); *La Iglesia en España desde la edad apostólica hasta la invasión de los Sarracenos: Reseña histórica* (Madrid, 1910). He prepared also the liturgy for the Spanish Reformed church, drawing it chiefly from Mozarabic sources. After 1874 he was editor of *La Luz*, the oldest evangelical periodical in Spain. In 1899 he published the eighth, and last, volume of his translation of Bishop Browne's *Exposition of the 39 Articles of the Anglican Church*.

CABRERA LATORRE, ká-brá'rà lá-tōr'rà, ÁNGEL (1879-). A Spanish naturalist, artist, and journalist. Born Feb. 19, 1879, at Madrid, he studied the humanities at the Universidad Central, receiving the degree of Licenciado en Filosofía y Letras (1900). Appointed assistant curator of the Madrid Natural History Museum (1901), he held that position until made

chief collector in Zoölogy (1913). He became in 1903 second editor of *Alrededor del Mundo*. He held various commissions: studying the organization of the department of mammals in the British Museum (1910); rearranging the collections of mammals in the Madrid Museum (1910-12); writing and illustrating a work on Spanish mammals and conducting expeditions connected therewith (1912-13); serving as head zoölogist of the expedition sent by the Real Sociedad Española de Historia Natural to Morocco (1913); and representing the Spanish government at the Ninth International Congress of Zoölogy at Monaco (1913). He became librarian of the Real Sociedad Española de Historia Natural, and a member of the Biological Society of Washington, etc. In recognition of his researches he was dubbed a Knight of the Order of Alfonso XII in 1904, and in 1907 was elected a corresponding member of the Zoölogical Society of London. Numerous articles in learned journals in Spain, England, and Chile give the results of his investigations.

CABRILLA, ká-brē'lyá (Sp.). One of several serranoid fishes, especially a grouper (q.v.) of Floridian and West Indian waters (*Epinephelus capreolus*); also the name of certain small fishes of the coast of southern California.

CABRILLO, ká-brē'lyó, JUAN RODRÍGUEZ (d. 1543). A Portuguese navigator who enjoyed a great reputation among his contemporaries as a man combining in an unusual degree ability, prudence, and daring. He entered the service of Spain and was sent in 1542 by the Viceroy Antonio de Mendoza to explore the coast of the country to the northwest of Mexico. He discovered successively Las Virgenes, Cape San Quentin, and the Bay of Todos los Santos, all in Lower California, and at the end of September became the discoverer of Alta California by sailing into San Diego harbor. Next he discovered the islands of San Clemente and Santa Catalina, and the Bay of Pueblo de las Canoas. Continuing his voyage, he discovered the large islands of Santa Cruz, Santa Rosa, and San Miguel, Point Conception, Point Pinos, and Monterey Bay, and finally Point Año Nuevo. Although within a few miles of San Francisco Bay, bad weather forced him to turn back to San Miguel Island, where he planned to spend the winter. Here he died Jan. 3, 1543. Consult T. H. Hittel, *History of California* (2 vols., San Francisco, 1885).

CABRIOLET. See CARRIAGE; MOTOR VEHICLE.

CABUL, ká-bōól'. See KABUL.

CACAO, ká-ká'ó or ká'kó, or **COCOA**, kó'kó (Sp., from Mex. *caca uatl*, coca tree). The different kinds of cacao either consist of, or are prepared from, the seeds of trees of the genus *Theobroma* (Gk., 'food of the gods'), which contains a number of species, trees of moderate size with large, undivided leaves and clustered flowers, borne on cushions on the trunk and older branches, all natives of the tropical parts of America. By far the most important species of this genus are *Theobroma cacao* and *Theobroma pentagona*. There are a number of varieties of each in cultivation, some of which are apparently hybrids. It should not be confounded with the coco tree, from which we get the coconut, or with the shrub *Orythroylon coca*, from which the alkaloid cocaine is obtained. It is extensively cultivated in tropical America and the West Indies, and its cultivation has been introduced into some parts of Asia and Africa. It requires

a deep, rich soil, heat, and moisture, for the most favorable growth. Sheltered valleys, free from hard winds, are desirable, and shade from other tall-growing, spreading trees is necessary. It generally rises with a bare stem 6 or 7 feet, dividing into many branches, and attaining a height of only 16 or 20 feet altogether, although it is sometimes twice that height. The fruit is somewhat like a cucumber in shape, and is 6 or 8 inches long, yellow or red, depending on the variety; the rind is thick and warty, the pulp sweetish and not unpleasant; the seeds are numerous, compressed, and not unlike almonds, with a thin, pale, reddish-brown, fragile skin or shell, covering a dark-brown, oily, aromatic, bitter kernel, which consists mostly of the wrinkled cotyledons. These seeds are the cacao beans of commerce. The cacao tree produces larger seeds in cultivation than in a wild state. The tree bears in four or five years, attains its full vigor and productiveness in 12 years, and generally yields two principal crops in the year. When gathered, the seed is removed from the pod and subjected to two to seven days' fermentation in bins, earthen vessels, or in heaps on the ground till the pulp becomes rotten. Formerly it was buried for a while in the earth. The fermentation is induced by yeasts, bacteria, etc., and upon the proper handling of the bean during this period largely depends the quality of the product. After fermentation, the beans are carefully dried under uniform conditions of heat and moisture, clay being sometimes added to facilitate drying and polishing. Cacao thus treated is known as "clayed cacao," or cacao terre. The yield per tree under favorable conditions will reach 15 to 20 pounds annually of cured cacao. Usually, however, the yield is from 2 to 3 pounds per tree, or 400 to 600 pounds per acre. Cacao suffers from a number of species of fungi; among them are: *Phytophthora faberi*, which causes a rot of the pods and a canker of the tree; *Nectria bainii* and *Nectria theobromæ*, which attack the pods and stems, causing a "bleeding" from the wounds; *Colletotrichum laxiflourum*, which causes swellings of the young shoots and the formation of "witch brooms"; etc.

In manufacturing cacao the seeds are screened, roasted, and decorticated, the kernel being known as cocoa nibs. The hulls make a cheap substitute known as *miserabile*. About two-thirds of the fat is removed and placed on the market in cakes known as cocoa butter and is thus used for emollients, pessaries, etc. The residue of the cacao nibs is ground, boxed, and sold as "cocoa," or is pressed into cakes after being sweetened and is known as "chocolate."

Cacao is very nutritious. The principal constituent of cacao beans is the soft, solid oil which forms more than 50 per cent of the whole shelled bean, about 22 per cent being starch, gum, mucilage, etc., and 17 per cent being gluten and albumen. They contain also a crystallizable principle called theobromine (see THEOBROMINE; CAFFEINE). The following figures show the average of analyses of cocoa and chocolate bought in open market:

	Protein	Fat	Carbohydrates
Cocoa.....	21.6%	28.9%	37.7%
Chocolate.....	12.9	48.7	30.3

Nine-tenths of cocoa is assimilated in the system. For dietetic use, cocoa is prepared in several ways. It is made into chocolate (q.v.); it is eaten in the solid state in the form of cakes and bonbons, or is scraped down and treated with boiling water or milk. When cacao nibs are infused with water like coffee, they yield a highly palatable beverage, which is much lighter than any other infusion of cacao. The large quantity of oily matter present in the bean tends to make the various infusions thick and heavy, so that they do not agree with some delicate stomachs. The annual consumption of cacao is upward of 100,000,000 pounds. An infusion of the broken and roasted shells of cacao beans is sometimes used in the same way as tea or coffee. The pulp of the fruit is eaten in the countries in which the tree grows, and a kind of spirit is obtained from it by fermentation and distillation. For illustration, see BEVERAGE PLANTS.

CACCIANIGA, kăt'châ-ně'gâ, ANTONIO MARIA GIACOMO (1823-1903). An Italian author, born at Treviso. In 1848 he founded in Milan the satiric periodical *Lo Spirito Folletto*. After the revolution of 1848 he was for six years in exile, living as a journalist in Paris. Subsequently he was elected mayor of Treviso and a parliamentary deputy. Of his numerous writings, his fiction is most enduring for its delicate sentimentality combined with vivacity of wit and a good sense of movement in plot. Typical works are *Villa Ortenzia* and *La famiglia di Bonifazio*. For short stories of regional coloring, see *Dolce far niente* and *Sotto i ligustri*.

CACCINI, kât-chě'ně, GIULIO (c.1550-1618). An Italian musician, born in Rome, and often called Giulio Romano for that reason. He learned to sing and to play the lute under Scipione della Palla and in 1564 went to Florence, where he spent most of his life. He was one of the musicians that met at the house of Bardi, where a new style, the *stilo rappresentativo*, was originated, which finally led to the beginnings of the opera (q.v.). Although Caccini himself claimed to have been the originator of the new style, recent researches have proved that this honor belongs to Peri (q.v.), and that Caccini's *Euridyce*, upon which opera he based his claim, was written after Peri's work of the same title, though both were produced in the same year (1600). Caccini leaned more to the *arioso* style, which paved the way for the later *bel canto*. His fame rests chiefly upon his *Nuove musiche*, a collection of madrigals for one voice with basso continuo. His other works are *Il rapimento di Cafalo*, *Dafne*, and a second collection of *Nuove musiche*. Consult A. Ehrlich, *Giulio Caccini* (Leipzig, 1908).

CÁCERES, kă'thâ-râs (anciently, Lat. *Castra Cœcilia*). A town of Spain, capital of the Province of Cáceres, in Estremadura, situated on a river of the same name, 25 miles west of Trujillo, in a rich agricultural district (Map: Spain, B 3). It is famous for its bacon, has manufactures of linen, woollens, leather, hats, soap, etc., and controls a large trade in the produce of the district. Pop., 1900, 16,933.

CÁCERES, kă'sâ-râs, ANDRÉS AVELINO (1836-1923). A Peruvian statesman and soldier. He was born at Ayacucho, in southern Peru, Nov. 10, 1836. At an early age he participated in the rising of Castilla, distinguished himself at the taking of Arequipa, and from 1857 to 1860 was

military attaché to the Peruvian legation at Paris. He fought in the Chilean War (1879-83), in which he was raised to the rank of general. After the capture of Lima he became the head of the provisional government. In 1884, in trying to dislodge Iglesias, whom the Chileans had set up as President, he was repulsed before Lima, but he gathered a larger force, entered the city in the following year, and induced the President to refer the presidential question to a popular election. The result was favorable to Cáceres, who was chosen President and inaugurated in June, 1886. In 1890 he was succeeded by Bermúdez, and went soon afterward as Peruvian Minister to France and Great Britain. Upon the expiration of Bermúdez's term of office, in 1894, the adherents of Cáceres seized the government and forced the Congress to choose him President. The party of Piérola took up arms, Lima was besieged, and on March 18, 1895, the city was taken by assault after a murderous fight. In a treaty of peace concluded between the two factions, Cáceres resigned the presidency and soon afterward fled the country, going to Panama. Piérola was elected President in his stead. At the end of the presidential term of Romafia he returned to Peru and again became a political figure of importance. In 1905 he was sent as Envoy Extraordinary and Minister Plenipotentiary of Peru to Italy. He also served as minister to France and minister to Germany.

CÁCERES, NUEVA. See NUEVA CÁCERES.

CACHALOT, kăsh'â-lôt. See WHALE.

CACHE, kăsh (Fr., from *cachier*, to hide). The name given by parties of travelers in uninhabited parts of North America to places for concealing provisions and other articles. Intending to return on their tracks, the traders disburden themselves of what articles can be spared and, in order to conceal them from Indians or others, construct places of deposit in the wilderness. A hole is dug (perhaps 6 or 8 feet deep and several feet broad) and, the articles being interred, the surface is replaced with care, and all traces of the excavation obliterated. The location of the cache is afterward found by some landmark or other sign. If containing provisions, the cache needs to be made to resist the depredations of animals, hence it is often covered with rocks. Prominently marked caches are built by expeditions in the Arctic regions as supply stations or for the use of distressed mariners. Continuous misuse has divested the term of its original idea of concealment, and it is now used, both as verb and noun to express the idea of putting away, or storing, but not necessarily covering.

CACHEO, kă-shâ'ôô, or **CACHEU**. A fortified town in Portuguese Guinea, West Africa, situated on the river Cacheo, about 10 miles inland. It was founded in 1588 and has an estimated population of 15,000, mostly natives. It has some trade in ivory and gold dust.

CACHEXIA, kă-kěks'î-â (Neo-Lat., Gk. *καχεξία*, *kachezia*, from *kakos*, *kakos*, bad + *êxis*, *hewis*, state). A medical term used to designate a diseased condition of the body, characterized by anæmia, yellowish color of the skin, and emaciation. Cachexia is always associated with severe organic diseases resulting in chronic poisoning of the blood; it is a feature of the advanced stages of tumor, tuberculosis, syphilis, malaria, gout, pyæmia (qq.v.) and other wasting diseases, each malady producing its peculiar modification of cachexia. In Bright's disease

the skin is waxy and edematous, the anæmia extreme, the eyelids puffy, the limbs often swollen. In malarial cachexia the skin is a dirty brownish yellow and the spleen enlarged. In the cachexia of advanced pulmonary tuberculosis emaciation is the most pronounced feature.

Cachexia strumipriva (described by Kocher) is a condition of anæmia and myxedema, with marked nerve disturbances, which follows total removal of the thyroid gland.

CACHOEIRA, ká-shwá'ê-rá (Portug. waterfall, cataract). A town in the state of Bahia, Brazil, situated on the Rio Paraguassu, 62 miles northwest of the city of Bahia, with which it is connected by rail (Map: Brazil, K 6). The town manufactures tobacco and cigars, the suburb St. Felix giving its name to the best brand of Brazilian tobacco. It also exports coffee, sugar, cotton, and fruits. Pop., about 15,000.

CACHOLONG, kish'ô-lông (probably *Cach*, a river of Bokhara, where it was originally found + Kalmuck *chalong*, stone). An opaque, milk-white, sometimes yellow or red, variety of opal. It has a conchoidal fracture and a pearly lustre, in consequence of which it is sometimes called *pearl opal*, or *mother-of-pearl opal*. It has also been found, associated with chalcedony, in Nova Scotia, on the Bay of Fundy.

CACHUCHA, ká-chô'chá (Sp.). An Andalusian dance of much grace. Its origin is unknown. It is written in 3-4 time, and resembles the *bolero* (q.v.). The *cachucha* is usually danced with castanets. It was introduced on the stage by Fanny Elssler, in the ballet of *Le diable boiteux*.

CACIQUE (pronounced ká-sék'ê because it is commonly used in Spanish-speaking countries. Ká-sék' would be the French pronunciation). A title borne by certain native princes or chiefs in the West Indies at the time of the discovery that was later applied by the Spaniards to dignitaries among the tribes of the New World coming under Spanish rule. The term was in common use in Mexico and Peru, where it was ordinarily restricted to governmental heads. Among the Pueblo Indians of New Mexico there are two caciques, a summer and a winter one, corresponding to the ceremonial division of the tribes. They hold office for life and, while principally concerned with religion, they have power to appoint the annual governmental officers. The native terms for cacique vary from tribe to tribe. In more recent times the title has been bestowed upon the chiefs of independent Indian tribes. Locke adopted this title in his *Fundamental Constitutions of Carolina* (1669). In this revival of feudal society there were to be, according to *The Grand Model*, two county dignitaries who should bear the title "cacique" and rank next after the landgrave.

CACIQUE, or **CAS'SICAN** (Sp., from native Haitian). Any of several iiterine birds of Central and South America, allied to the Baltimore oriole and forming the genus *Cassicus*. They are noted for their intricately woven pensile nests, composed of grass or thin bark, in the form of a purse or pouch, sometimes a yard long, and suspended from the extremity of a branch of a tall tree, apparently to insure safety from monkeys and serpents. Several of these nests are often to be seen hanging from the branches of the same tree. (See Plate of PENSILE NESTS OF BIRDS, with the article NIDIFICATION.) The name "cassican" is also given sometimes to the piping crow of Australia and Papua.

CAC'ODYL, or **KAK'ODYL** (Gk. *κακῶδης*, *kakōdēs*, ill-smelling + *ὄλη*, *hyle*, wood, stuff, matter). An organic substance composed of carbon, hydrogen, and arsenic. It is a highly poisonous liquid and it takes fire spontaneously if exposed to the air. Its formula is $As_2(CH_3)_4$. Its *oxide*, $As_2(CH_3)_4O$, is obtained by distilling a mixture of arsenious oxide and potassium acetate; in the pure state it does not, like cacodyl, take fire on exposure to the air; it readily combines with acids to form salts, such as cacodyl chloride, $As(CH_3)_2Cl$; cacodyl cyanide, $As(CH_3)_2CN$, etc. The univalent *cacodyl group*, $As(CH_3)_2$, was the first metallo-organic radicle known to chemists. Its discovery by Bunsen, following Wöhler and Liebig's discovery of the benzoyl group, had an important influence on the development of the science of organic chemistry. See CHEMISTRY.

CACOMISTLE, kík'ô-mis'-l (native Mex.), or **BASSARISC**. A small animal (*Bassariscus astutus*) of the raccoon family, inhabiting Mexico and adjacent parts of the United States. Its body is about 16 inches long, and its tail about 15. It is rather slender, with a sharp, foxlike face, and large, bright eyes, surrounded by light patches, which, with the erect ears, give an alert and pleasing expression to the countenance. The fur is long, soft, and light brown above, darker along the back, and the long, bushy tail has six or eight broad, white rings; the under parts are white. It has much the same habits as a raccoon, catching small mammals, birds, and insects, and is often tamed and regarded as a most pleasing pet among miners, who usually call it the American civet cat. Consult *Bulletin Am. Mus. Nat. Hist.* (New York, 1895). See Plate of CARNIVORES (MINOR AMERICAN).

CACOUNA, ká'kô's'ná'. A picturesque and fashionable watering place in Temiscouata Co., Quebec, Canada (Map: Quebec, J 3). It is situated on the right bank of the St. Lawrence River, 114 miles from Quebec. It contains numerous summer cottages of wealthy Canadians, has good hotels and boarding houses, while a smooth, sandy beach affords admirable bathing facilities. It is also resorted to for trout fishing and hunting. A small Indian settlement is situated near the beach. Pop., 1901, 589; 1911, 653.

CACTA'CEÆ. See CACTUS.

CACTUS (Lat. from Gk. *κάκτος*, *kaktos*). A general name given to the peculiar plants which belong to the family Cactaceæ. These plants are specially adapted to the arid regions of America. They are chiefly displayed in Mexico, but are very abundant also along the Mexican border of the United States, and some of them extend even far north on the plains. They are also found to some extent more eastward, in the West Indies, and also southward in South America. Aside from a few African species, the 1000 known forms are restricted to America. However, the common prickly pear, a species of *Opuntia*, has been long naturalized throughout the Mediterranean region, where its fruit is known as the "Indian fig."

The peculiar habit of the family seems to have been the result of perennial drouth conditions, to which they have become better adapted, perhaps, than any other plant forms. The twofold problem which is presented to them is to prevent any unnecessary loss of water contained in their tissues and to retain all of the scanty supply which reaches them. As a result, their

bodies are very succulent, containing a large amount of water-storage tissue, which retains water with great tenacity. Their bodies are also very much reduced in surface exposure, leaves being abandoned, and the stem often assuming cylindrical to globular forms. The globular form is perhaps the most complete answer to the problem of reducing surface exposure and retaining mass. Instead of leaves and branches which appear upon ordinary plants, the cactus forms display various ephemeral or abortive structures, the most notable of which are the bristles and spines. The cactus forms are not all of compact habit, for species of *Pereskia* are climbing and woody, with well-developed leaves. The flowers of the group are usually conspicuous and remarkably brilliant in color. The largest forms are species of *Cereus*, with thick columnar and fluted bodies, bearing a few clumsy branches, and sometimes attaining a height of 50 or 60 feet. These treelike columnar forms are especially well developed in the drainage basin of the Gulf of California, and sometimes occur in extensive masses known as "cardon forests."

About 20 genera of cacti are recognized, of which about six occur in the United States. The generic lines are, however, very uncertain and shifting, so that no definite number can be given. The most common genera are as follows: *Mamillaria* includes the globular to short cylindrical forms, which are not ribbed, but which have prominent tubercles bearing clusters of spines. It is the largest in point of numbers of all the genera, containing more than 300 species. *Echinocactus* also contains globular to short cylindrical forms, but they are strongly ribbed, and are usually larger than any of the *Mamillaria* forms. It is the second genus in point of numbers, containing about 200 species. *Cereus* contains species with mostly elongated stems, which are stout, columnar, or sometimes cylindrical, and always ribbed or angled. Species of *Pilocereus* are often seen in greenhouses, and resemble the columnar forms of *Cereus*, but have an abundance of white hairs instead of rigid spines, and are frequently spoken of as "old-man cactus." *Opuntia* contains about one hundred and fifty species, and includes forms which are branched and jointed, the joints being flat or cylindrical. The flat-jointed forms are the well-known "prickly pears." Consult: Engelmann and Bigelow, "Description of Cactaceæ," in *United States War Department Reports of Exploration for Railroad to the Pacific* (Washington, 1856); Kunzé, *Cactus; Its History, Classification, . . . and Therapeutical Application* (Albany, 1875); Coulter, *Preliminary Revision of the North American Species of Cactus, Anhalonium, and Lophophora* (Washington, 1894-98); and *Preliminary Revision of the North American Species of Echinocactus, Cereus, and Opuntia* (Washington, 1896).

CACTUS WREN. See WREN.

CACUMAZIN. See CAMINATZIN.

CACUS. In Roman legend, a monstrous being (son of Vulcan, by some accounts) who dwelt in a cave on the Aventine Hill, before the foundation of Rome. When Hercules, returning to Greece with the cattle of Geryon (q.v.), stopped to rest in the grassy plain by the Tiber, Cacus, selecting the most beautiful of the cows, drew them into his cave backward, by the tail, so that their tracks might not betray him; but their lowing, as Hercules, wonder-stricken, drove

their mates away, attracted attention to the cave, and he slew Cacus. The story is told in Livy (i, 7) and in Vergil, *Æneid*, viii, 184-279. To celebrate the victory Evander built the Ara Maxima in honor of Hercules. Confusing the name *Cacus* with *kakós*, *cacus*, bad, later authorities counted him "The Evil One," in contrast with Evander (q.v.), whose name they interpreted as "Good Man." Consult Preller-Jordan, *Römische Mythologie*, vol. ii (Berlin, 1881-83).

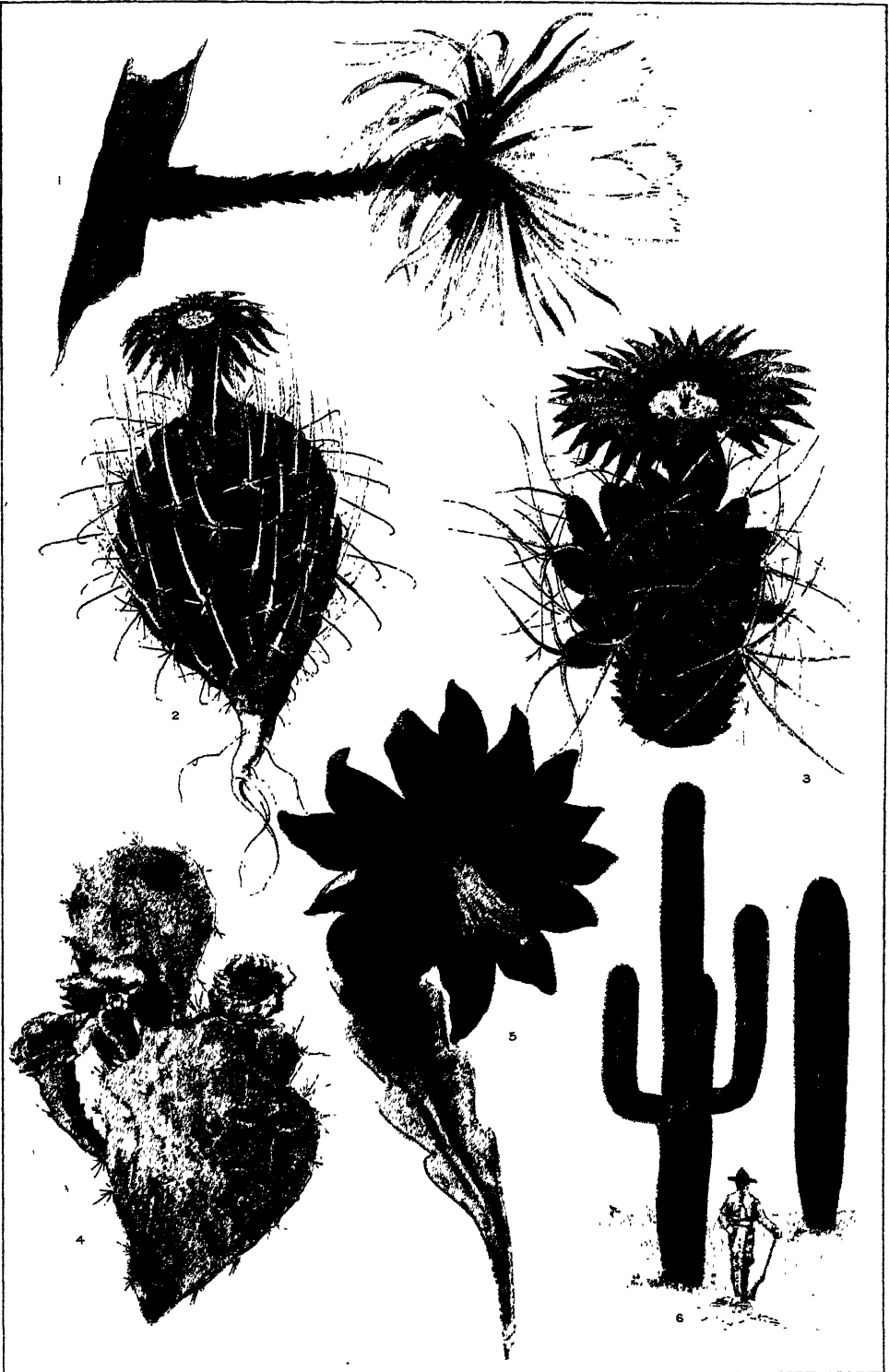
CADALSO Y VÁZQUEZ, ká-dál'só ē vās'káth, JOSÉ DE (1741-82). A Spanish poet, born in Cadiz. After having passed most of his youth at Paris, he traveled extensively in England, Germany, and Italy, and upon his return to Spain entered the army. He distinguished himself in the war against Portugal and rose to be colonel. At the siege of Gibraltar he was killed by the explosion of a bomb. His literary productions were confined to the period 1771 to 1774, while his regiment was stationed at Salamanca. Here, seconded by the Augustinian monk Diego Tadeo González, he founded the Salamantine poetic school. Among his works are: the tragedy *Sancho García Conde de Castilla* (1771); the satire *Los Eruditos á la Violeta* (1772); *Poemas* (1773), among which the *Noches lúgubres* were inspired by Young's *Night Thoughts*, and written at the death of his mistress, the actress María Ignacia Ibáñez; *Cartas marruecas* (1793) in imitation of Montesquieu's *Lettres persanes*. They appeared in a complete edition in 1818, as *Colección de obras en prosa y en verso* (Madrid); and again, ib., 1821, in 3 vols. Consult also *Biblioteca de Autores Españoles*, vol. lxi; and *Obras inéditas* (ed. by R. Foulché-Delbos), *Revue hispanique*, vol. i (1894).

CADAMOSTO, ká'dá mō'stò, or **CA DA MOSTO**, ALVISE DA (c.1432-c.77). An Italian navigator and discoverer, born in Venice. He made some commercial voyages about the Mediterranean and the Atlantic, and in 1455, under commission of the Infante Dom Henrique of Portugal, sailed, by way of Senegal and Cape Verde, to the mouth of the Gambia. In 1546 he undertook a second journey, discovered the Cape Verde Islands, and thence reached the mouth of the Rio Grande. He wrote an exceedingly interesting account of his voyages, *El libro de la prima navigazione per oceano alle terre de' Nigri della Bassa Etiopia* (1507).

CADAS/TRAL SURVEY (from Fr. *cadastre*, a public register of the quantity, value, and ownership of the real property of a country). A term applied to a topographical survey, in mapping which the various artificial and natural objects are drawn to exact scale instead of being exaggerated for the sake of clearness, as is usually done in ordinary topographic mapping. The term is usually applied in connection with the Ordnance Survey of Great Britain, which is on the scale of 1/250,000, or 25,344 inches to a mile. See SURVEYING.

CADDIS FLY. A neuropteroid insect of the order Trichoptera, the larvæ of which, usually aquatic, are commonly known as caseworms. Caddis flies show much resemblance to small moths, on account of their long antennæ, moth-like wings, and nocturnal flight. The body and wings are hairy, and some species possess scales. Four wings are generally present, but *Thamastes* has only the anterior pair, while in *Anamalopteryx* there is a curious dimorphism, the wings being quite short in the male, but of normal

CACTI



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- 1 NIGHT-BLOOMING CEREUS - CEREUS GRANDIFLORUS
- 2 WHIPPLES SPRING CACTUS - ECHINOCACTUS WHIPPLEI
- 3 NIPPLE CACTUS - MAMMILLARIA MACROMERIS

- 4 ENGELMANN'S TUNA - OPUNTIA ENGELMANNI
- 5 ACKERMANN'S LEAF-CACTUS - PHYLLOCACTUS ACKERMANNI
- 6 GIANT CACTUS - CEREUS GIGANTEUS

length in the female. They are seen mainly about streams and ponds, but a few are marine, and the genus *Onoicyla* is terrestrial. "The eggs are laid in a double mass, which is gelatinous and usually green in color. They are usually attached to the surface of some water plant. . . . The larvæ are all aquatic, . . . and they are nearly all protected by a case of some sort." These larvæ are long and cylindrical, with a hard head and thoracic segments, but soft abdomen, to cover which the worm forms a tubular shelter, composed of bits of stick, moss, leaves, sand, or small stones, bound together with silk; and this is dragged about, or may be attached to some submerged object, preferably a stone at the bottom of rapidly running but shallow water. These cases are very diverse, from simple tubes to spirals very closely resembling snail shells. Since they open behind, a current of water is allowed to pass through, and thus the respiratory filaments on the abdomen are aerated. The caseworm retains its hold in the tube by means of a pair of claws located at the apex of the abdomen. These larvæ are largely vegetable feeders, but will occasionally eat insects, and such species spin near the mouth of the tube a net of silk which is cup shaped when drawn out by the water current, and catches prey. The caddis worms ("cadbait" of anglers) live several months in this condition, and some regularly through the winter. "When ready to transform to pupa," says Howard, "both ends of the case or tube are protected by a silk netting spun by the larva, which transforms in security, well drawn back from either orifice. When ready to transform to the adult stage, the pupa works its way through the guarded orifice, swims to the surface of the water, and crawls out."

These insects have been but little studied in America; yet about 150 species are known. They may be studied to advantage by placing the larvæ in a wire cage in their native stream, the cage extending above the water, so that the insect may emerge, but not escape. The most prominent family is Phryganeidæ, which contains the species of largest size. Consult McLachlan, *Monograph of the Trichoptera* (London, 1874-80), the authority for European forms. A list of species and key for genera, by N. Banks, may be found in *Transactions of the American Entomological Society* (Philadelphia, 1892); also a paper by Needham and Betten in the *New York State Museum Bulletin No. 47* (Albany, 1902). Consult also Vorhies, in *Wisconsin Academy of Science, Arts, and Letters, Transactions*, vol. xv (1905) and vol. xvi (1909).

CADDO, kăd'dô. An important Indian confederacy, from which the Caddoan stock derives its name, formerly holding the territory from the middle Red River in Louisiana westward nearly to the Brazos River in Texas. The name by which the tribes call themselves is Hasinai, whence the French *Asinais* and *Cenis*, Caddo being the abbreviated form of the name of their principal tribe. There are about a dozen subtribes, with 10 gentes. Like most tribes of this stock, the Caddo were sedentary and agricultural and were especially distinguished in early years for their friendly and hospitable character. They now number about 500, residing on allotments within their former reservation in western Oklahoma, which was opened to white settlement in 1901.

CADDOAN STOCK. An Indian linguistic

group represented in the South by the Caddo and Wichita and associated tribes, and in the North by the Pawnee and Arikara (q.v.). Their original home seems to have been the lower Red River country of Louisiana and Arkansas, whence the Caddo and Wichita moved westward into Texas and the Indian Territory, while the Pawnee moved northwestward and settled upon the lower Platte in Nebraska. The Arikara of North Dakota are a comparatively recent offshoot from the advance guard of the Pawnee. Like the Southern Indians generally, the Caddoan tribes were agricultural and more or less sedentary. In all their shifting they have retained these characteristics, preferring solidly built houses of earth-covered logs or grass thatch to the portable tepee, and depending more upon their gardens of corn and pumpkins than upon the buffalo hunt. They have dwindled almost to disappearance, the entire stock numbering now less than 2000 souls, although within living memory the Pawnee alone numbered 10,000.

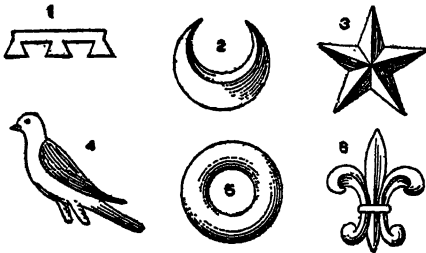
CADE, JACK (?-1450). The leader of an insurrection beginning in Kent, England, June, 1450. He was of Irish birth and had served in the French wars. According to some accounts he assumed the name of Mortimer and claimed relationship with the Duke of York, but it is not certain that Cade and Mortimer were the same person. The rebels marched with 20,000 to 30,000 armed men on London and encamped at Blackheath, where Cade was in command and whence he kept up a communication with the citizens, many of whom were in secret sympathy with the rising. The court sent to inquire why the "good men of Kent" had left their homes. Cade, in a paper entitled "The Complaint of the Commons of Kent," replied that the people were being robbed of their goods for the King's use; that mean and corrupt persons, who plundered and oppressed the commons, filled the high offices at court; that it was "noised that the King's lands in France had been aliened"; that misgovernment had banished justice and prosperity from the land; that the men of Kent were especially ill-treated and overtaxed, and that the free election of knights of their shire had been hindered. In another paper, called "The Requests by the Captain of the Great Assembly in Kent," Cade demanded that the King should resume the grants of the crown, which he complained the creatures about the royal person fattened on, while the King was compelled to live on taxation; that the false progeny of the Duke of Suffolk should be dismissed; and that the Duke of York and others should be restored to favor, and a number of persons punished. The court sent its answer in the form of an army, before which Cade retreated to Sevenoaks, where he awaited the attack of a detachment, which he defeated. The royal army refused to fight against their countrymen; the court made some concessions, and Cade entered London on July 3. For two days he maintained the strictest order; but he forced the Lord Mayor and the judges to pass judgment upon several, including Lord Say, one of the King's most unpopular favorites, whose head was immediately cut off in Cheapside. On the third day some houses were plundered, and this brought about a reaction on the part of the citizens of London. Cade, who at night lodged his army in the suburbs, received news that the citizens intended to prevent his entrance into the city on the next day, and in the night he

made an attack on the bridge, but was defeated. The promise of pardon sowed dissension among his followers, who dispersed, and a price was set upon Cade's head. He attempted to reach the Sussex coast, but was slain near Lewes by Iden, the sheriff of Kent, on July 12. Consult Kriehn, *The English Rising of 1450* (Strassburg, 1892), and Clayton, *True Story of Jack Cade* (London, 1909).

CADELL', FRANCIS (1822-79). A Scottish explorer, born at Cockenzie. At the age of 14 he entered the service of the East India Company as midshipman and in 1844 was appointed to command a vessel. In 1848 an examination of the mouth of the Murray River, in Australia, convinced him of the navigability of that river, as to which he was further satisfied by an extended tour of exploration undertaken in 1850. He promoted the formation of a navigation company, the first of whose steamboats accomplished, in 1853, a voyage of 300 miles. Until 1859 he was busily concerned in explorations. In 1867, when sailing in command of his schooner, the *Gem*, from Amboyna to the Kei Islands, he was murdered by the crew.

CADENCE. See HARMONY, *Cadences*.

CADENCY (ML. *cadentia*, from *cadere*, to fall). In heraldry, the marks by which the shields of the younger members of families are distinguished from those of the elder and from each other. The study of such devices constitutes an extensive and important branch of the heraldic science. Nine marks of cadency are recognized in modern heraldry. The first son bears the label (Fig. 1); the second, the crescent (Fig. 2); the third, the mullet (Fig. 3); the fourth, the martlet (Fig. 4); the fifth, the annulet (Fig. 5); the sixth, the fleur-de-lys (Fig. 6); the seventh, the rose; the eighth, the cross



moline; the ninth, the octofoil. This system may be indefinitely continued, by charging label upon label, etc., for the grandsons. No distinction is usually made by writers on heraldry—and probably the practice of heralds in general scarcely admits of any being made—between marks of cadency, differences, distinctions, or even brisures, though the last term is quite constantly and appropriately used to include not only differences in general, but also abatements or bearings by which the arms of the family are broken or diminished. See BATON.

CADENUS. A name assumed by Jonathan Swift in a poem addressed to Miss Vanhomrigh, and entitled *Cadenus and Vanessa*, which the lady's executors published in Dublin, in 1726, but which had been written more than 10 years before. The name is an anagram for the Latin word *decanus*, i.e., dean. See VANESSA.

CADENZA, kă-dên'tsă (It., descent, from Lat., It. *cadere*, to fall). In music, a brilliant passage of ornamental notes introduced towards

the end of a musical composition designed to exhibit the virtuosity of the performer. In instrumental pieces it is usually based on themes of the work itself. In former times it was left to the performer to improvise his own cadenzas, but Beethoven was the first to compose them himself rather than rely on inapt performers. Since the time of Schumann all composers have written their cadenzas in full as an integral part of the composition. For some of the older works excellent cadenzas have been written by such masters as Moscheles, Reinecke, Rosenthal, Sauer, Ysaye, etc.

CAD'ER IDRIS (Welsh, chair of Idris, the giant). The second highest among the mountains of Wales, in Merionethshire, 5 miles south-southwest of Dolgelly, between the estuaries of the Mawddach and the Dovey rivers (Map: Wales, C 4). It is 7 miles long, and 1 to 3 miles broad; the highest peak, Pen-y-gader, has an elevation of 2914 feet. The view from the cairn at the summit extends far over the Irish Sea and as far as the Wrekin in Shropshire.

CADET', MILITARY (Fr., younger brother, Provençal *cadet*, from ML. *capitellum*, dim. of Lat. *caput*, head; so called to distinguish him from the elder brother, who was the real head of the family, after the father. The military meaning arose from the fact that the younger sons of the French nobility were generally provided for in the army). A student or an accepted candidate for a military commission; in the United States army cadets are educated at the Military Academy (q.v.), West Point, N. Y., and the present method of their appointment has been in operation since 1843. The age for admission to the Military Academy is between 17 and 22 years of age; appointments may be made one year in advance of the date of admission; this rule, however, is not always observed. Whenever a vacancy exists in a given district or state, the War Department notifies the Representative or Senator, who may then either appoint directly or throw the appointment open to competitive examination. By Acts of Congress approved June 6, 1900, June 28, 1902, March 3, 1903, May 28, 1908, and August 9, 1912, the Corps of Cadets as now constituted consists of one from each congressional district, one from each Territory, two from the District of Columbia, one from Porto Rico, two from each State at large, and 40 from the United States at large, all to be appointed by the President. Those cadets appointed from States or Territories must be actual residents of the congressional or territorial districts, or of the District of Columbia, or of the States, respectively, from which they are appointed. Four Filipinos, one for each class, are authorized to receive instruction as cadets, to be eligible on graduation only to commissions in the Philippine Scouts. Under these Acts, and under the apportionment of members of Congress according to the thirteenth census, the maximum number of cadets is 580. Under Act of Congress approved April 19, 1910, the law, however, provides that for six years from July 1, 1910, whenever any cadet shall have finished three years of his course at the Academy his successor may be admitted. Foreigners are sometimes admitted by Act of Congress; they pay their own expenses and are not candidates for a commission. The appointment from a congressional district is made upon the recommendation of the Congressman from that dis-

trict, and those from a State at large upon the recommendations of the Senators of the State. Similarly, the appointment from a Territory is made upon the recommendation of the Delegate in Congress. Each person appointed must be an actual resident of the State, District, or Territory from which the appointment is made. The appointments from the District of Columbia and those from the United States at large are made by the President of the United States upon his own selection, either directly or after competitive examination. These latter appointments were originally designed for the benefit of sons of army officers, who, having no permanent abode, are thus debarred from securing an appointment in the usual way. The course of instruction covers a period of four years, and at its conclusion the cadets are commissioned second lieutenants in the United States army. See MILITARY ACADEMY, UNITED STATES, for account of the education of cadets, and also for an historical sketch of the institution.

In England cadets are trained at Woolwich (q.v.) for the artillery and the engineers, and at Sandhurst (q.v.) for the infantry and the cavalry. A similar system of appointment, preparation, and education of military cadets prevails among all European armies, further details of which may be found under MILITARY EDUCATION; SANDHURST; STAFF COLLEGE.

CADET, NAVAL. The lowest grade of officers of the line, or executive branch, in nearly all navies. In the United States navy the title was *cadet-midshipman* until changed to naval cadet by Act of Congress in 1882. In 1902 an Act of Congress was passed and approved restoring the old title of *midshipman*. The midshipmen are under instruction at the Naval Academy, Annapolis, for four years, and then serve two years at sea in regular cruising ships, when they are commissioned as ensigns. The ages of entrance to the Academy are from 15 to 20 years, but efforts are being made to reduce the upper age limit to 18. According to the present law, the number of midshipmen allowed at the Academy is two for each Representative, Delegate, and Senator, to be appointed by them, and 10 at large, and one for the District of Columbia, appointed by the President. See NAVAL ACADEMY, UNITED STATES.

The number of cadets in foreign navies is limited by the number of applicants or the requirements of the service. The examination of cadets for the British navy takes place in London and Portsmouth in March, July, and November, and the limits of age are 13½ and 14½ years. The cadets are trained in the Royal Naval Schools at Dartmouth and Osborne. In France the school for naval cadets is on board the stationary training ship *Borda* at Brest. The period of training is two years, and the age of entrance is from 14 to 18 years. In Germany the naval cadets are instructed at the Naval Academy at Kiel. The age of entrance must not exceed 19 years, and the requirements are such that very few boys under 16 are likely to pass the entrance examination. See NAVAL SCHOOLS OF INSTRUCTION.

CADI, *kā'dē*, or **KADI** (Ar. *qādī*, judge, from *qadāy*, to judge). The title of an inferior judge among the Mohammedan nations, who, like the Mullah (q.v.), or superior judge, was originally also a theologian, since all law is founded upon the Koran. The Cadi is differently appointed in different countries; in Tur-

key, where he is also called Naib, he is appointed by the Mufti or Sheikh al-Islam, at present the highest religious authority in Islam, and receives a fixed salary; in Persia and in Middle Asia the office is more in the nature of a private affair.

CADILLAC. A city and the county seat of Wexford Co., Mich., 98 miles north of Grand Rapids, on the Grand Rapids and Indiana and the Ann Arbor railroads (Map: Michigan, D 4). It is picturesquely situated on Little Clam Lake in a noted hard-wood timber region and has extensive lumber interests, machine shops, a charcoal iron furnace, wood alcohol, chemical works, table, chair, shoe-last, and veneer factories. The city contains a hospital, public library, and fine city hall and county courthouse buildings. Settled in 1871, Cadillac was incorporated in 1874 and in 1914 adopted the commission form of government, providing for a mayor and four commissioners. Pop., 1900, 5997; 1910, 8375.

CADILLAC, *kā'dē'yāk'*, ANTOINE DE LA MOTHE (c.1660-1720). A French military officer, the founder of Detroit, Mich. He was born in Gascony, of a noble French family, spent some time in Acadia as a captain in the French army, and in 1694 was appointed by Frontenac commander of Michilimackinac. Here he remained until 1697, when he laid before Louis XIV his plan for a permanent settlement as a trading post for the Northwest. With the King's approval he founded Detroit in 1701, with 50 settlers and 50 soldiers. He was Governor of Louisiana from 1712 to 1717, when he returned to France, where he died. Cadillac, Mich., was named for him. Consult Parkman, *A Half Century of Conflict* (Boston, 1892).

CADIZ, *Sp. Cádiz*, pron. *kā'bēth* (Fr. *Cádiz*; anciently, Lat. *Augusta Iulia Gaditana*, earlier *Gades*, Gk. *Gádeipa*, *Gadeira*, from Phœnician *Gadīr*, hedge, stockade, fort). A city of Spain, in Andalusia, capital of the province of its name, and one of the most important seaports of the kingdom, situated on the Atlantic (Map: Spain, B 4). It is built on a narrow tongue of land projecting from the Isla de León. The harbor of Cadiz is spacious, strongly fortified, and divided into two parts—the large roadstead between Santa Catalina and Cadiz, and the smaller but safer harbor between the fortifications of Matagorda and Puntales. The town is surrounded by strong walls on the northwest and south, and by numerous fortresses which guard the entrances to the outer and inner harbors.

Cadiz presents a picturesque appearance, the whiteness of its buildings forming a striking contrast with the blue ocean. In its arrangement it is one of the most modern of Spanish cities, and although its limited site does not admit of wide avenues or extensive squares, its narrow streets are well paved and lighted, and of clean appearance. The houses are invariably whitewashed, and in most cases surmounted by towers, or *miradores*, affording an excellent view of the sea. The main street is the Calle del Duque de Tetuán, and the chief squares are the Plaza de la Constitución, Plaza de Mina, and Plaza de la Catedral. Cadiz has a fine promenade, the Alameda de Apodaca, extending along the water on the north, and the extensive Parque Genoves with a summer theatre. The two cathedrals are of recent construction and possess little architectural merit. In the southern part of the city is situated the old Capuchin convent,

now used as an asylum, with the small church of Santa Catalina, containing Murillo's "Espousal of St. Catharine," a work which derives special interest from the fact that the master died while engaged in its execution. In the centre of the town is situated the Torre de Vigia, a watchtower about 100 feet high, used as a signal station and affording a magnificent ocean view. The mean annual temperature of 64° F. does not vary much more than 10° above in summer or 10° below in winter; but the oppressive summer dampness, coupled with insufficient drainage and an inadequate water supply, results in a high death rate, about 44 per 1000. The city is the seat of a bishop and of a number of consular representatives. The educational institutions include a faculty of medicine affiliated with the University of Seville, schools of art and commerce, a theological seminary, and a number of minor schools. There are also a number of theatres and libraries and an archaeological museum. The Academia de Bellas Artes contains a fine gallery of Italian and Spanish paintings.

The commercial importance of Cadiz has declined, owing partly to the decreased communication with South America and the West Indies. The chief exports are sherry, olive oil, salt, and southern fruits. There is regular steam communication with Great Britain, the Canary Islands, the West Indies, France, South America, and Morocco. Pop. (communal), 1887, 62,531; 1900, 69,382; 1910, 67,174.

History. Cadiz is one of the most ancient towns in Europe, having been built by the Phœnicians, under the name of Gadir, about 350 years before the foundation of Rome, or about 1100 B.C. It afterward passed into the hands of the Carthaginians (about 500 B.C.), from whom it was captured by the Romans, after the Second Punic War. The Romans named it Gades, and under them it soon became a city of vast wealth and importance, because of its trade in fish and in the products of the valley of the river Bætis (Guadalquivir). Julius Cæsar gave its people Roman citizenship in 49 B.C. One of these citizens was Lucius Columella (q.v.). Juvenal and Martial mention the gay, luxurious habits of the Gaditani. It was occupied by the Goths from the dissolution of the Roman Empire (fifth century A.D.) to the battle of the Guadalete, when the Moors took possession of the southern peninsula. (See SPAIN.) It was taken by the Christians in 1262 under Alphonso X of Castile. In 1587 Drake destroyed the Spanish ships of war at Cadiz. In 1596 the town was captured and sacked by the English under Howard and Essex. In the eighteenth century, because it monopolized Spanish trade with Spanish America, it became once more prosperous and wealthy. In 1800 the city was bombarded by Nelson. The French invested the place in 1810-12, but were compelled to raise the siege when the Duke of Wellington came to the aid of the city. It was at Cadiz that the Cortes proclaimed the liberal constitution of 1812; for this act, and for the efforts made by the citizens of Cadiz in 1820-23 to secure the renewal of this constitution, and by the French, representing the Holy Alliance, to thwart these efforts, see SPAIN, *History*. In 1823 the Cortes retired to Cadiz and made a stand against the French army of invasion. In August the French stormed the Trocadero, and the struggle of the Constitutionalists was brought to a close. Since

that time, as noted above, the importance of Cadiz has diminished, because of the loss by Spain of its colonies in America, and the consequent decrease in communication between Spain and South America and the West Indies.

CADIZ. A village and the county seat of Harrison Co., Ohio, about 25 miles northwest of Wheeling, W. Va., on a branch of the Pittsburgh, Cincinnati, Chicago, and St. Louis Railroad (Map: Ohio, H 5). It has a public library and important commercial interests in wool, poultry, coal, oil, and gas, and, though but a village, is noted as a banking centre, ranking among the leading municipalities of the State. The water works are owned by the village. Cadiz was the home of Edwin M. Stanton. Pop., 1910, 1971.

CADMAN, S (AMUEL) PARKES (1864-). An American clergyman. He was born in Wellington, Shropshire, England, graduated at Richmond College (London University), and after coming to the United States received from several universities the degree of D.D. In 1895 he became pastor of the Metropolitan Temple (New York), after five years' service being called to the Central Congregational Church, Brooklyn. He was elected a trustee of Adelphi College, Brooklyn, and of the Brooklyn Institute of Arts and Sciences, and became well known as a Y. M. C. A. speaker. In 1913-14 he was acting president of Adelphi College. He wrote *Charles Darwin and Other English Thinkers* (1911) and *Three Great Oxford Movements*.

CADME'A, or CADMEI'A. The name given to the acropolis (q.v.) of Thebes in Bœotia, (q.v.), because it was said to have been founded by Cadmus (q.v.). The citadel was a low eminence and antedated the surrounding city. Only fragments of its walls remain.

CADME'ANS, or CADMEI'ANS. The name given by the Greek dramatists to the inhabitants of Bœotian Thebes.

CADMEAN VICTORY. A popular expression for a gain secured at great loss, referring to the mutual slaughter of the warriors who sprang up from the dragon's teeth sown by Cadmus (q.v.). See PYRRHIC VICTORY.

CAD'MIA (Lat., the ore of zinc, dross, or slag formed in a furnace, from Gk. *kadula*, *kadmia*, calamine). The term applied to the crust formed in zinc furnaces, which contains from 10 to 20 per cent of cadmium. At a few of the zinc smelters this is saved and refined for cadmium.

CADMIUM (Neo-Lat., from Lat. *cadmia*; see CADMIA). A metallic element discovered in 1817 by Stromeyer. It is not found native, but occurs as the sulphide in the mineral greenockite, and in association with zinc ores. Greenockite is found in Bohemia and in Hungary; also in Lehigh Co., Pa., but in too small quantities to be of commercial importance. Cadmium is a constituent of most zinc ores, and as it is more volatile than zinc it passes over first, in the reduction of such ores, as cadmium oxide. This is collected, mixed with charcoal, and the mixture heated in iron tubes, from which the cadmium distills over in a more or less impure state. In order to purify it, the metal is re-distilled and the product dissolved in hydrochloric acid, from which solution metallic cadmium is precipitated with zinc. Most of the cadmium of commerce comes from Silesia, but small quantities are produced also in the Joplin district, Missouri.

Cadmium (symbol, Cd; atomic weight, 112.4)

is a bluish-white lustrous metal with a fibrous fracture and capable of taking a high polish. Its specific gravity is 8.65. It melts at 320° C. (608° F.) and boils at 778° C. (1432° F.). The molecules of its vapor have been shown to be made up of single atoms, like the molecules of mercury vapor. It finds some use in the manufacture of alloys, as it generally increases the fusibility of metals without destroying their malleability. An amalgam of cadmium and tin is used in dentistry.

Cadmium forms a regular series of salts, of which the iodide, obtained by digesting one part of the metal with two parts of iodine in water and evaporating the solution, is used in medicine, and also for iodizing collodion. The most important compound of cadmium is the sulphide, which is precipitated by hydrogen sulphide. Cadmium sulphide is an orange or lemon-yellow powder that is of great permanency and is used as a pigment under the name of *cadmium yellow*. It is also used for coloring toilet soaps, for the production of blue flames in pyrotechny, and in calico printing. During the year 1911, 5367 pounds of cadmium, valued at \$3870, were imported for consumption into the United States. The total German production in that year was 93,861 pounds, valued at \$53,272. Consult Ingalls, *Metallurgy of Zinc and Cadmium* (New York, 1903).

CADMUS (Gk. Κάδμος, *Kadmos*). According to Apollodorus the Grammarian and the later mythographers, the son of Agenor, King of Phœnicia, and Telephassa, and brother of Europa (q.v.). When Europa was carried off by Zeus, Cadmus and his brothers, as also their mother, were sent in quest of her, with injunctions from Agenor not to return without her. Their search was vain, and the oracle at Delphi told Cadmus to relinquish it, and to follow a cow which he should meet, and build a city where it should lie down. He found the cow in Phocis, followed it to Bœotia, and built there the city of Thebes, of which the acropolis was called Cadmea. When he sent some of his companions to a spring for water, they were slain by a dragon, guardian of the well of Ares; Cadmus slew this dragon, and sowed its teeth, from which sprang armed men, called Sparti, 'The Sown.' Angered by a stone which Cadmus threw among them, they fought together till only five remained, who took service with Cadmus and became the ancestors of Theban families. See Ovid, *Metamorphoses*, iii, 1-130. Some of the teeth, however, were unused, and were later sown by Jason (q.v.) in Colchis. Cadmus married Harmonia, daughter of Ares and Aphrodite, and had by her five children, Polydorus, Ino, Autonoe, Agave, and Semele. Later he went to Illyria. He was considered the inventor of many useful arts and to him was attributed the introduction of the Phœnician alphabet into Greece. This story, however, is unknown to the earlier Greek writers and has been compiled out of many scattered and often inconsistent local legends. The Phœnician origin of Cadmus seems an invention of the Asiatic Greeks, and it is quite impossible to use the story as a basis for any historical narrative of Phœnician colonists in Bœotia. It has been held, rather, that Cadmus was a Grecian (Bœotian) hero, comparable to the Cadmus or Cadmillus (= Hermes) worshiped in the mysteries of the Cabeiri (q.v.) at Samothrace. For a full collection of the material and bibliography, consult

Crusius, s. v. "Kadmos," in Roscher, *Lexikon der griechischen und römischen Mythologie* (Leipzig, 1884).

CADOGAN, kă-dŭg'an, GEORGE HENRY, EARL (1840-1915). A British statesman. He was born in Durham and studied at Christ Church College, Oxford. In 1873 he was returned as a member of Parliament for Bath, and in 1875 was appointed Undersecretary of State for War. From 1878 to 1880 he was Undersecretary for the Colonies, and from 1886 to 1892 Lord Privy Seal. From 1895 to 1902 he served as Lord Lieutenant of Ireland. He took a prominent part in the discussion of the Irish Land Bill in 1887. In 1911 he became chairman of the National Society for the Prevention of Cruelty to Children.

CADOL, kă'dôl', VICTOR EDOUARD (1831-98). A French dramatist, born in Paris. He was at first in the government service, but afterward became a journalist, was a member of the *Temps* staff, and with About, Sarcy, and Gasperiini founded *L'Esprit Français*. He published a long list of works, many written in collaboration. There may be mentioned: *Les ambitions de M. Fauvel* (1867); *La fausse monnaie* (1869); *Paris pendant le siège* (1871); *La spectre de Patrick* (1872); *Mariage de princesse* (1888); *Thérèse Gervais* (1893); *L'archiduchesse* (1897). His dramatic works were collected in 1897 as *Théâtre inédit* (1897).

CAD'OMUM. See CAEN.

CAD'OOBER'GIA WOOD. See EBONY.

CADORNA, COUNT LUIGI. See VOLUME XXIV.

CADORNA, kă-dôr'nă, RAFFAELE (1815-97). An Italian general, born in Milan. During the Crimean War he commanded a battalion of infantry and in 1854 served as a lieutenant colonel on the general staff. In 1860 he was appointed Minister of War in the provisional government of Tuscany and in 1866 military commandant of Sicily. He was sent in the latter year to Palermo and succeeded in crushing the remnants of the Bourbon insurrection. In 1870 he captured Rome, of which he was for a time military Governor. In 1871 he became a member of the Senate. He published: *Osservazioni sull'amministrazione centrale della guerra* (1854); *Bibliografia delle campagne per l'indipendenza italiana* (1882); *La liberazione di Roma nel 1870* (1889).

CA' D'ORO. See CASA D'ORO.

CADOUDAL, kă'dô's'dăl', GEORGES (1771-1804). The leader in the Chouan insurrection during the French Revolution. He was born near Auray, in Lower Brittany, where his father was a miller, and was among the first to take up arms against the republic, soon acquiring great influence over the peasants. Captured in 1794, he was sent as a prisoner to Brest, whence he soon made his escape. Annoyed at the dissensions between the Vendean generals and the emigrant officers, and the disasters consequent thereon, Cadoudal organized an army in which no noble was permitted to command, and which it taxed all the great military talents of Hoche to disperse. In 1797 Cadoudal was the soul of the conspiracy to overthrow the Directory and place a Bourbon on the throne; but the events of the 18th Fructidor frustrated the plan of the conspirators. He continued to carry on a guerrilla warfare in Lower Brittany long after the regular armies of the Vendée had surrendered. Bonaparte recognized Cadoudal's energy and force of character and offered to make him a lieutenant general in his army. Cadoudal re-

fused. Fearing arrest, he fled to England, where, in 1802, he conspired with Pichegru for the destruction of the First Consul. With this design he went to Paris, but was arrested, condemned, and executed June 25, 1804. Cadoudal was a man of stern honesty and indomitable resolution. "His mind was cast in the true mold; in my hands he would have done great things," was Napoleon's estimate of him. Consult Georges de Cadoudal, *Georges Cadoudal et la Chouannerie* (Paris, 1887).

CADRE, kâ'dr' (Fr., frame, from Lat. *quadrum*, square). The commissioned and noncommissioned staff officers, including the artificers and musicians, of a regiment. The term includes practically all the officers, noncommissioned officers, and men necessary in the construction of a framework or organization, around which may be assembled the rank and file required to constitute a regiment. It is peculiarly a French institution, and has particular application to the permanent regimental headquarters staff, about which a reserve regiment would assemble if mobilized.

CADUCEUS, kâ-dû'sê-ûs (Lat., from Gk. κηρύκειον, *kêrykceion*, Doric κάρυκειον, *Æolic karûkeion*, herald's staff; the interchange of *n* and *r* in Latin was helped, it has been thought, by popular etymology, which connected the word with *cadere*, fall, often used of dying). The winged staff of Mercury, or Hermes, as he was called by the Greeks, with which he controlled the living and the dead so that he could go, unmolested, where he willed; he carried it especially when he escorted the dead to the world below. In its earliest form it is composed of three branches—one forming the handle and the other two intertwined. This is also the herald's staff, as it appears in early works of art, and is borne also by Iris as well as by earthly messengers. Later the place of the intertwined branches is taken by snakes, and in a still later form the staff is furnished with wings. Homer refers to the magic golden wand of Hermes, but without reference to its form. Among the moderns the caduceus is used as an emblem of commerce, over which Mercury was the presiding divinity.

CADURCUM. See CAHORS.

CADWALADER, kâd-wôl'â-dêr, GEORGE (1804-79). An American lawyer and soldier. He was born in Philadelphia, where he studied law and practiced that profession. He was a brigadier general of volunteers in the Mexican War, and for his services at Chapultepec was brevetted major general. He again practiced law until the outbreak of the Civil War, became a major general of volunteers in April, 1862, and in the same year was appointed a member of the commission to revise the military laws and regulations of the United States. He was the author of *Services in the Mexican Campaign of 1847* (1848).

CADWALADER, or **CADWALLADER**, JOHN (1742-86). An American soldier. He was born in Philadelphia, where he served as a member of the Committee of Safety, and at the beginning of the Revolutionary War was made commander of the Pennsylvania militia, with the rank of brigadier general. He participated in the battles of the Brandywine, Germantown, Monmouth, and Trenton, and in July, 1778, fought a duel with Gen. Thomas Conway, the leader of the cabal against Washington. (See CONWAY CABAL.) He published *A Reply to*

Gen. Joseph Reed's Remarks (1783). Subsequently General Cadwalader was a member of the Maryland Legislative Assembly.

CADY, J. CLEVELAND. An American architect, born at Providence, R. I. He received an M.A. from Trinity College in 1880 and an LL.D. in 1905. Beginning the practice of his profession in 1870, he became known principally as a designer of public, or semipublic, buildings. His first important commission was for the new home of the Brooklyn Art Association. He designed a number of college buildings, including some 15 for Yale, and various structures for Williams, Trinity, and Wesleyan. The Metropolitan Opera House, the American Museum of Natural History, many hospitals, commercial buildings, churches, and dwellings in various parts of the country were planned by him, or under the firm name of Cady and Gregory. He also wrote on architectural subjects, contributing to the *Outlook*, the *Independent*, and the *Homiletic Review*.

CÆCII/LA GENS. A plebeian clan of Rome of which mention is found as early as the fifth century B.C. Its family names are Bassus, Denter, Metellus, Niger, Pinna, and Rufus.

CÆCILIA METEL/LA, Tomb or. The most conspicuous ruin on the Appian Way, near Rome, the magnificent burial place of the daughter of Metellus Creticus and daughter-in-law of the triumvir Crassus. The tomb, formerly known as Capo de Bove, from its frieze of ox skulls, is a circular edifice measuring 65 feet in diameter, standing on a square base. The whole was sheathed with travertine, which was removed under Pope Sixtus V for use in other buildings. The tomb was converted by the Cestani family into a battlemented stronghold in the thirteenth century. The secret passage to the crypt was accidentally found by workmen who were dismantling the base in the sixteenth century. The sarcophagus is still preserved.

CÆCILIIDÆ, sê-sî'lî-dê (Neo-Lat., from Lat. *Cæcilia*, a kind of lizard, from *cæcus*, blind). A family of degenerate, wormlike, burrowing amphibians of the tropics. See BLIND-WORM, 3.

CÆCILIVS STATIVS, sê-sî'lî-ûs stâ'shî-ûs (?-168 B.C.). A Roman comic poet and dramatist, an Insubrian Gaul by birth. He was brought to Rome as a prisoner of war about 200 B.C., but was freed, probably by one of the Cæcili Metelli, from whom he took the name Cæcilius. He was on intimate terms with Ennius (q.v.). He wrote *fabulæ palliatæ*, i.e., comedies based on Greek originals. In the canon (q.v.) of comic poets made by Volcaci Sedigitus he is ranked first among the comic poets of Rome. Varro and Cicero speak well of him; Cicero, admitting his power, counts him inferior to Terence in style and in purity of Latin. Cæcilius kept more closely to his Greek originals than did Plautus, less so than Terence. For the few fragments, preserved mainly by Cicero and Aulus Gellius, consult Ribbeck, *Comicorum Romanorum Fragmenta* (Leipzig, 1898).

CÆCOMORPHÆ (Neo-Lat., from Lat. *cæcus*, blind + Gk. μορφή, *morphê*, shape, form). An order of birds agreeing in cranial structure (schizognathous and schizorhinal), externally characterized by having palmate feet, and embracing the loons, grebes, sea fowl, gulls, albatrosses, petrels, and allied forms. The term is almost obsolete, these groups being now split up into many separate orders.

CÆCUM, sē'kūm (Lat. *cæcus*, blind). A blind pouch in the human intestine into which the small intestine empties. It is also called the *caput coli*, or head of the colon. The colon, or large intestine, starts from it, in the hollow of the right iliac region, and runs upward, in its first part. The cæcum in man is too small to serve as an important part of the digestive tract and is comparatively useless. From it springs the vermiform appendix (q.v.), generally posteriorly, the lumen of the appendix opening into the cavity of the cæcum. The microscopic structure of the walls of the cæcum does not differ in any essential from that of the rest of the large intestines. (See **INTESTINES**.) There are four coats, the mucous, the submucous, the muscular, and the serous. The mucous coat consists of a lining of simple cylindrical epithelium, which is continuous with the epithelium of simple tubular glands, which lie side by side and are supported by a loose lymphoid connective-tissue stroma. Beneath this is a single or double layer of muscle, the *muscularis mucosæ*. Beneath this is a vascular connective-tissue layer, the *sub-mucosa*, which often contains lymph nodules. Passing outward from the submucosa, the next coat is the muscular, divided into an inner layer, whose cells are disposed circularly to the lumen, and an outer layer, whose cells have their long axes directed longitudinally. In the cæcum and large intestine the circular layer is usually thinner than in other parts of the gastro-intestinal canal, and the outer layer is incomplete, being arranged in three longitudinal bands, which are shorter than the other coats of the intestines and give it a sacculated appearance. The serous coat is a thin connective-tissue layer covered over with a single layer of flat endothelial cells.

Cæcum in Animals. In many of the mammalia, and particularly in most of those which are herbivorous, the cæcum is comparatively large, and is found to secrete an acid fluid resembling the gastric juice. It therefore appears that, where the nature of the assimilatory process is such as to require the detention of the food for a considerable time, this provision is made for it in order that digestion may be more completely accomplished. The cæcum is entirely wanting in some quadrupeds, as in bats, and the bear and weasel families. Birds have two cæca, which are generally long and capacious in those that are omnivorous or granivorous, and the position of which is the only circumstance that marks the division of the intestine into two parts, the small and the large intestine, or the *ileum* and the *colon*. The first traces of the true cæcum are found in reptiles, where it is mostly of small size. Fishes have no true cæcum occurring in the position occupied by those of quadrupeds and birds, but many of them have fluid sacs attached to the intestine at its uppermost part, known as pyloric cæca, and serving to increase the digestive surface. The number of these cæca, however, is extremely various; sometimes there is only 1, and sometimes nearly 200. The number is different even in very nearly allied species of the same family; thus, there are only 6 in the smelt, but 70 in the salmon, 24 in the herring, and 80 in the shad. In some fishes, as in the cod, the cæcum consists of large trunks ramified into smaller ones.

CÆDMON, käd'mon. An English poet of the second half of the seventh century. The only information of any weight concerning him

is in Bede's *Ecclesiastical History* (iv, 24), which was completed in 731. According to Bede, Cædmon was a man of "secular habit," living in the monastery at Whitby, in old Northumbria. One night while sleeping in the stables, he saw a vision, whence came a voice commanding him to sing the origin of created things. Cædmon immediately began to sing of God the Creator. After relating the story of the poet's inspiration, with many details, Bede says: "Thus sang he of the creation of the world, and the beginning of the race of men, and all the history of Genesis; of the exodus of Israel from Egypt, and the entrance into the promised land; of many other stories of the Holy Scriptures; of the incarnation of the Lord, His passion, resurrection, and ascension; of the coming of the Holy Ghost, and the teachings of the Apostles; also of the terrors of the future judgment and the horror of hell punishment, and the sweetness of the heavenly kingdom." There is now in the Bodleian Library, Oxford, a manuscript (West Saxon, tenth century) of sacred epics, of which the poems known as Genesis, Exodus, Daniel, Christ, and Satan correspond with the substance of Cædmon's *Paraphrase*, as described by Bede. They have been ascribed, especially by F. Junius (1655) and Thorpe as late as 1832, as a whole, or in part, to Cædmon. The best criticism, however, as represented by the investigations of Sievers (1877), holds that some of them, and perhaps none, are his; that they belong, rather, to a class of popular religious poems, which may be called, if one likes, Cædmonian. The theme of these poems anticipates that of Milton's great epics; and attempts have been made to connect Milton directly with the Cædmon *Paraphrase*. Other poems besides those mentioned have been credited to Cædmon. Of great philological interest—for it is written in the Northumbrian dialect—is the hymn which Cædmon is supposed to have composed in his dream. These verses are preserved in a manuscript of Bede's *History*, now at Cambridge. For text of the Cædmon poems, consult: Grein's edition of Wülker, *Bibliothek der angelsächsischen Poesie*, vol. ii (Leipzig, 1894); for a translation, Thorpe, *Cædmon* (London, 1832); for account of Cædmon and the poems, Ten Brink, *Early English Literature*, translated (London, 1883); and Morley, *English Writers*, vol. ii (London, 1888). A good bibliography of the works relating to Cædmon and his exposition is given in *The Cambridge History of English Literature*. Consult also Gajšek, *Milton und Cædmon* (Vienna, 1911).

CÆLIA GENS. A plebeian clan of Rome with the family names Calvus and Rufus. The gens name is generally written Cælius on coins.

CÆLIAN. One of the hills of Rome. See **ROME**.

CÆLIMONTANA. The smallest of the 14 regions into which Augustus divided Rome. It included part of the Cælian Hill and contained the Temple of Claudius, the palace of Commodus, the palace of the famous family of the Laterani, and the great market of Nero.

CÆLIUS, MARCUS RUFUS. A Roman noble of the first century B.C. He had considerable talent as a writer and orator, but was conspicuous for his profligacy. In 56 B.C. Clodius' sister, Clodia Quadrantaria (Catullus' Lesbia), whom Cælius had deserted, after making her false to Catullus (q.v.), accused Cælius of having made an attempt to poison her, and of having bor-

rowed money from her in order to procure the murder of Dion, the Alexandrian ambassador. Cicero, with whom Cælius kept up an active correspondence (still, in part at least, extant), successfully defended him in an oration which has been preserved (Cicero, *Pro Cælio*). On the outbreak of the Civil War in 49 B.C., he supported Cæsar, who rewarded him by appointing him to the prætorship in 48 B.C. Soon afterward his own enormous debts led him to bring forward a law for the abolition of debts, whereupon he was deprived of office. He was killed at Thurii while attempting to raise an insurrection in favor of Pompey. Cælius was a friend of Catullus, then for a season his rival; after Cælius' break with Lesbia he and Catullus became friends again.

CÆLIUS AURELIANUS. A Latin medical writer in the fifth century A.D., a resident of Sicca in Africa. He translated from the Greek an important work on acute and chronic diseases, by Soranus (q.v.). Large parts of the translation are still extant, and form the chief source of our knowledge of Soranus and his school. He was an exponent of the "methodic" school of medicine and is to-day the best known of the translators of Greek works on medicine.

CAEN, kân (anciently, Lat. *Cadomum*). The capital of the Department of Calvados, France, formerly the capital of Lower Normandy, situated on the left bank of the Orne, about 9 miles from its mouth and 149 miles west-northwest of Paris (Map: France, N., E 3). Caen is built in the middle of a fertile plain; its clean, wide streets, and fine squares, together with many old houses and structures of Norman architecture, make it an attractive city. There are a number of churches of historic interest, and the castle (started by William the Conqueror, finished by Henry I, and at present used as a barracks), a university, a museum, a public library with over 100,000 volumes, and many other educational and industrial institutions. The city manufactures lace, crape, cutlery, cotton yarn, leather, furniture, and chemicals; and has breweries, dye works, foundries, sawmills, and shipbuilding yards. Its Angora gloves, made from the unwashed, undyed fur of Angora rabbits, which are reared in the district, are celebrated. Quarries in the neighborhood produce Caen stone. Trade is facilitated by a maritime canal connecting the port with the sea, and also ample railway connections, and includes exports of iron ore, stone, dairy products, and fruit, and imports of coal, timber, and grain. Pop., 1896, 45,380; 1906, 44,442; 1911, 46,934. Caen was known as Cadomum in the early part of the eleventh century. It first assumed importance under William the Conqueror and was captured and pillaged by Edward III of England in 1346. It was the focus of the Girondist movement against the Convention in 1793. Consult Delarue, *Histoire de Caen* (Paris, 1842), and Prentont, *Caen et Bayeux* (Paris, 1909).

CAEN (kâ'en or, Fr. pron. kân) **STONE.** A soft, light-colored limestone well adapted for plain and carved ornamental work, obtained near Caen in Normandy. The quarries have been celebrated since a very early period. The excellence of the stone and the facility of transport by sea led to the very extensive use of Caen stone in England in the fifteenth and sixteenth centuries. In 1460 the Abbot of Westminster obtained a license to import Caen stone

for the repairs of the monastery. Later it became a regular article of importation, and in 1582 it was rated at the customhouse at 6s. 8d. the ton. Winchester and Canterbury cathedrals, Henry VII's chapel at Westminster, and many churches are built of Caen stone, which is still frequently used in England. The quarries are subterranean, and the stone, in blocks of 8 or 9 feet long and about 2 feet thick, is brought to the surface through vertical shafts. Owing to its porous and soft nature, the stone is unfitted for exterior work in a severe climate like that of the United States, but is used for the interiors of churches and other buildings. See LIMESTONE.

CÆRE, sê'râ. See **ÆRARIANS**; **CERVETRI.**

CÆRITES. See **ÆRARIANS**; **CERVETRI.**

CÆRLEON, kâr-lê'on (Welsh *caer*, fortress, castle, town + *leon*, legion). An ancient town in Monmouthshire, England, on the Usk, 2 miles northeast of Newport (Map: England, D 5). It is the Isca Silurum of the Romans and is supposed to have been the capital of the Roman province of Britannia Secunda, now Wales, and the residence of the famous King Arthur. It was the seat of an ancient archbishopric, which was removed to St. Davids in the eleventh century. Many Roman remains have been discovered in the neighborhood, and a great number of the smaller antiquities have been gathered into a very fine collection in the town museum. Near by is a large amphitheatre; also an artificial mound which has been given the name of King Arthur's Round Table. Pop., 1891, 1411; 1901, 1367; 1911, 2046.

CÆRMARTHEN. See **CARMARTHEN.**

CÆRNARVON, kâr-nâr'von. See **CARNARVON.**

CÆRULARIUS, MICHAEL. The Patriarch of Constantinople from 1043 to 1059, who completed the breach prepared by Photius between the Latin and Greek churches. He did away with the use of the Latin ritual in many Bulgarian churches, and in a letter to the Bishop of Trani, Apulia, made formal attack upon Rome. His complaints were bitter restatements of those long previously made, including particularly the use by the Latins of unleavened bread in the sacrament of the Lord's Supper. In consequence of this letter, Pope Leo IX sent to Constantinople ambassadors who were kindly received by the Emperor Constantine Monomachus, but resisted by Michael, who later succeeded in influencing the Emperor's attitude. Thereupon the papal legates deposited on the altar of the church of St. Sophia a bull of excommunication and departed. Michael continued in power until banished by the Emperor Isaac Comnenus in 1059. There are extant some decretals of Michael, and Henricus Canisius gives several letters in his *Antiquæ Lectiones*. Consult Pichler, *Geschichte der kirchlichen Trennung zwischen dem Orient und Occident* (Munich, 1864).

CÆS'ALPINIA (after the Italian botanist Cæsalpinus). A genus of trees of the family Leguminosæ, the type of the subfamily Cæsalpinieæ. This subfamily is characterized by irregular flowers, which are not papilionaceous, and contains more than 700 known species. Among the members of the groups many are notable for their purgative properties, as senna (q.v.); some produce eatable fruits, as the tamarind (q.v.), the carob (q.v.), and the West Indian locust tree (q.v.); some yield resinous

and balsamic products, as copaiba (q.v.) and aloes wood; some produce important dyewoods, as logwood (q.v.), brazilwood (q.v.), and camwood (q.v.); and some are trees of great size, and very valuable for their timber, as the purplewood (q.v.) and the wallaba trees of Guiana. No species of the suborder is British, and it generally belongs to warm climates. The genus *Cæsalphinia* contains about 40 species of trees and shrubs with pinnate or bipinnate leaves, handsome purple or yellow flowers in racemes, natives of the warm parts of Asia and America, which yield the brazilwood, Pernambuco wood, and sapun wood (q.v.) of commerce, also the astringent pods called dividivi (q.v.), used in tanning. Some of the species are highly ornamental, as the royal poinciana (*Cæsalphinia regia*, or *Poinciana regia*) and the dwarf poinciana (*Cæsalphinia pulcherrima*).

CÆSALPINUS, sēs'äl-pī'nūs. See CÆSALPINO.

CÆSAR. The cognomen of the most renowned branch of the patrician *Gens Julia*, which claimed descent from the mythical Iulus, son of Æneas. The earliest Cæsar mentioned in history is Sextus Julius Cæsar, who held the office of prætor in 208 B.C. The great Cæsar (see below) left no direct male descendant to bear his name. Since he adopted Octavius (afterward the Emperor Augustus), the latter took the name. From Augustus, it passed also through adoption to his immediate successors Tiberius and Caligula. Claudius and Nero, though not Julii, continued the name, which died out as a family name when Nero was killed. Henceforth it became a title of the reigning emperor; Vitellius alone refused to accept it. From Trajan's reign it stands regularly after the title "emperor" (*Imperator Cæsar*). Later the title *Cæsar* was used to designate especially the heir presumptive to the throne, though it did not cease to be part of the Imperial title. From it are derived the titles of the Russian Czar and the German Kaiser.

CÆSAR, GAIVS JULIVS (102-44 B.C.). A famous Roman general, statesman, and writer; one of the most remarkable men of all time. He was the son of a Roman prætor of the same name and was born July 12, 102. Two circumstances conspired to determine his sympathies in favor of democracy and against a republican oligarchy. The first was the marriage of his aunt Julia with Gaius Marius; the second, the marriage of Cæsar himself, in 83, with Cornelia, daughter of L. Cinna, one of the principal enemies of Sulla. The anger of the dictator at this cost Cæsar his rank, property, and almost his life itself. Feeling that he would be safer abroad for a time, he went to Asia (81); but on learning of the death of Sulla (78), he hurried back to Rome, where he found the popular party in a state of great ferment and anxious to regain what it had lost under the vigorous despotism of the aristocratic dictator. Cæsar, however, took no part in the attempts of Lepidus to overthrow the oligarchy; but he showed his political leanings by prosecuting (77) Cn. Dolabella—a great partisan of Sulla—for extortion in his province of Macedonia. To improve his eloquence, he went to Rhodes to study under the rhetor Apollonius Molo. In 74 he returned to Rome, where he had been elected pontifex, and now for the first time threw himself earnestly into public life. In the year 70 he attached himself to Pompeius, whose political

actions at this time were of a decidedly democratic character. In 68 Cæsar obtained a quaestorship in Spain. On his return to Rome (67) he married Pompeia, a relative of Pompeius, with whom he was daily becoming more intimate. In 65 he was elected to the curule ædileship and lavished vast sums of money on games and public buildings, by which he increased his already great popularity. For the next few years Cæsar is found steadily skirmishing on the popular side. In 63 he was elected pontifex maximus and shortly after prætor. During the same year occurred the famous debate on the Catiline conspiracy, in which the aristocratic party vainly endeavored to persuade the consul, Cicero, to include Cæsar in the list of conspirators. In 62 Pompeius returned from the East, and disbanded his army. Next year Cæsar obtained, as proprætor, the Province of Hispania Ulterior. His career in Spain was brilliant and decisive. On his return he was elected consul, along with M. Calpurnius Bibulus (60). Cæsar, with rare tact and sagacity, reconciled the two most powerful men in Rome, who were then at variance—Pompeius and Crassus—and formed an alliance with them, known in history as the *First Triumvirate* (60). Both of these distinguished men aided Cæsar in carrying his Agrarian Law (59); and to strengthen still further the union which had been formed, Cæsar gave Pompeius his daughter, Julia, in marriage, though she had been promised to M. Brutus; while he himself married Calpurnia, daughter of L. Piso, his successor in the consulship. On the expiration of his term of office he obtained for himself, by the popular vote, the Province of Gallia Cisalpina and Illyricum for five years, to which the Senate added—to prevent the popular assembly from doing so—the Province of Gallia Transalpina. Nothing could have been more favorable to Cæsar's aims. He had now an opportunity of developing his extraordinary military genius, practically unhampered by governmental restraint from Rome, and of gathering round him an army of veterans, whom perpetual victory should inspire with thorough soldierly fidelity and devotion to his person. This was the very thing he wanted to give him a reputation equal to that of his coadjutors, Pompeius and Crassus, whom in genius he far surpassed. Leaving, therefore, the political factions at Rome to exhaust themselves in petty strifes, Cæsar, in 58, after the banishment of Cicero, repaired to his provinces, and during the next eight years conducted those splendid campaigns in Gaul by which, had he done nothing else, he would have "built himself an everlasting name." Cæsar's first campaign was against the Helvetii, who were migrating from Switzerland into Gaul, and whom he totally defeated near Bibracte (Mont-Beuvray, near Autun). Out of 368,000 men, women, and children, only 110,000 remained. These were commanded by Cæsar to return home and cultivate their lands, to prevent them from falling into the hands of the Germans. The eyes of the Gauls were now turned upon the new conqueror, whose aid was solicited against an invader from beyond the Rhine, the German chief Ariovistus. Cæsar advanced against Ariovistus, who was utterly overthrown. And now Cæsar, having in the course of one campaign successfully concluded two important wars, led his troops into winter quarters.

Next year (57) occurred the Belgic War, in which Cæsar successively routed the Suessiones,

the Bellovaci, the Ambiani, and the Nervii, who, alarmed at the progress of the Roman arms, had entered into an alliance against the invaders. When the Senate received Cæsar's official dispatches, it decreed a thanksgiving of 15 days—an honor never previously granted to any general. During the winter and the spring following, Cæsar stayed at Luca, and after spending large sums of money in hospitality and for other less praiseworthy purposes, he departed for Gaul, where the flames of war had burst out in the northwest. The Veneti, a maritime people of Brittany, who possessed fleets of large vessels, were the chief instigators of the insurrection. Cæsar's plans were laid with consummate skill and were crowned with the most splendid success. The Veneti were totally defeated, and most of the other Gallic tribes were either checked or subdued. Cæsar wintered in the country of the Auleri and Lexovii (Normandy), having in the course of three campaigns conquered Gaul. Next year (55) Crassus went to the East (where he was slain by the Parthians in 53), and Pompeius to Spain, while Cæsar's provincial government was prolonged for five years. He now undertook a fourth campaign against two German tribes who were about to enter Gaul. He was again successful; and, pursuing the fleeing enemy across the Rhine, which he had bridged, spent 18 days in plundering the district inhabited by the Sigambri. He next invaded Britain about the autumn, but after a brief stay in the island returned to Gaul. The Roman Senate, astonished at his hardihood and his successes in regions where no Roman army had ever been before, accorded him a public thanksgiving of 20 days. In 54 Cæsar opened his fifth campaign by a second invasion of Britain. In this invasion he crossed the Thames, but, constantly beset by Cassivelaunus, he returned to Gaul. In neither expedition did he accomplish much; as Tacitus says (*Agricola*, 10), "he showed where Britain was: he did not conquer it." On his return to Gaul he was compelled—on account of the scarcity of grain, arising from drought—to winter his army in divisions. This naturally aroused the hopes of the Gauls, who thought the time had come for recovering their independence. An insurrection broke out in the northeast of Gaul, which was at first partially successful in the complete destruction by the Eburones, led by Ambiorix, of a legion at Aduatua, but was ultimately crushed. Cæsar resolved to winter at Samarobriua (Amiens) in the vicinity of the malcontents. In 53 he commenced his sixth campaign. It was chiefly occupied in crushing a second insurrection of the Gauls.

Cæsar then returned to northern Italy, that he might be able to communicate more easily and securely with his friends in Rome. That city was gradually becoming more anarchic, the evils of weak government more apparent; the hour for decisive action seemed to be approaching, and doubtless Cæsar's heart beat with expectation of the mighty future reserved for his boundless ambition, when all at once the prospect was darkened by a tremendous rebellion extending over the whole of Gaul, headed by the Arverni, led by a young warrior named Vercingetorix. It was in the dead of winter when the news came to Cæsar, who instantly saw that, at all hazards, he must preserve his fame and his army. Leaving, therefore, his rival Pompeius to succeed at Rome, he hurried to

meet the insurgent hordes. His great difficulty was to collect his scattered legions. First crossing, with some Cisalpine and provincial troops, the mountains of Auvergne, though they lay 6 feet deep in snow, he suddenly appeared among the Arverni, who, terrified at his unexpected approach, sent for their chief, Vercingetorix, to come to their assistance. This was precisely what Cæsar wished. After some wonderful exhibitions of military skill and numerous successes by the Romans, such as the capture and destruction of Avaricum, Vercingetorix was shut up in Alesia (Alise in Burgundy), with all his infantry. Cæsar besieged him, and though harassed by nearly 300,000 Gauls without, who attempted, but in vain, to break through the well-defended Roman lines, he forced Vercingetorix to capitulate. Many of the tribes now hastened to submit to Cæsar, who prudently determined to winter among the vanquished. The Senate voted him another public thanksgiving. In the next year (51) Cæsar proceeded to quell the tribes who still held out. This he successfully accomplished, and having, in addition, reduced the whole of Aquitania, passed the winter of his eighth campaign at Nemetocenna in Belgium, where he spent the time in a manner both politic and magnanimous. The Gallic princes were courteously and generously treated; the common people were spared the imposition of further taxes; and everything was done to render it possible for him to visit Italy with safety in the spring. This he did, and took up his residence at Ravenna, where he was informed by the tribune C. Curio of everything that was going on. There can be no doubt that at this moment he was the most popular man in the state, while his soldiery were devoted to him with a loyalty as enthusiastic as that which Bonaparte inspired when fresh from his Italian victories.

It should be noted that in 56, at a conference held at Luca, the triumvirs, Pompeius, Crassus, and Cæsar, had renewed their agreement of 60 B.C.; as a consequence Cæsar's command in Gaul had been prolonged for five years, from March 1, 54. But after Julia, wife of Pompeius, and daughter of Cæsar, died in 54, and Crassus was killed in 53, Pompeius, whose vanity could not endure the greatness of Cæsar, had been gradually inclining again to the aristocracy, whose dread of the new conqueror was hourly increasing. In 52 Pompeius caused the annulment of earlier legislation by which it had been ordained that there should be no discussion of the question of a successor to Cæsar till after March 1, 50; the advantage of the earlier legislation to Cæsar had been that by March 1, 50, the provinces would have been assigned for 49 B.C., and Cæsar would be able to retain his command and consequent exemption from accountability for his acts in Gaul, many of which were in seeming and in fact unconstitutional, till the close of 49. By that time he had expected, by the earlier arrangement, to be consul for 48. After much futile diplomatic *finesse* on all sides, the Senate carried a motion (in 50 B.C.) "that Cæsar should disband his army by a certain day; and that if he did not do so he should be regarded as an enemy of the state." The tribunes Marcus Antonius and Q. Cassius put their veto on this motion; but they were violently driven out of the Senate chamber, and, fearing for their lives, they fled to Cæsar's camp. The Senate, in mad terror, now declared war, and intrusted the



GAIUS JULIUS CÆSAR
FROM THE BRONZE BUST IN THE BERLIN MUSEUM

conduct of it to Pompeius, whose pride in the invincibility of his military prowess hindered him from taking the necessary measures for the defense of the state. He fancied that his name would bring thousands to his standard, and he was even led to believe that Cæsar's troops were willing to desert their general; the result of which delusion was that, when hostilities formally commenced, he had hardly any soldiers except two legions which had recently been in the service of his rival. Cæsar, on the other hand, perceiving that the time for decisive action had at length come, having harangued his victorious troops, who were willing to follow him anywhere, crossed the Rubicon (a small stream which separated his province from Italy proper: by crossing that, armed, he became technically a *hostis*, a public enemy), and moved swiftly, amid the acclamations of the people, towards Rome. Pompeius fled to Brundisium (Brindisi), pursued by Cæsar, but contrived to reach Greece in safety, March 17, 49 B.C. The Italian cities had everywhere gladly opened their gates to the conqueror as a deliverer. Within three months Cæsar was master of all Italy.

Cæsar next went to Spain, and subdued Pompeius' legates, who were at the head of considerable forces. On his return he took Massilia (Marseilles), where he learned that he had been appointed dictator of the republic—a function which at this time he retained for only 11 days; but these were honorably distinguished by the passing of several humane enactments. Pompeius, now thoroughly alive to the magnitude of his danger, had gathered a powerful army in Egypt, Greece, and the East, while his fleet swept the sea. Cæsar, however, crossing the Adriatic at an unexpected season, hastened to Dyrrhachium, where Pompeius' stores were, but was nevertheless outstripped by his opponent. Pompeius intrenched his army upon some high ground near the city, where he was besieged by Cæsar. The first encounter was favorable to Pompeius, who drove back Cæsar's legions with much loss. The latter now retreated to Thesaly, followed by his exulting enemies. A second battle ensued on the plains of Pharsalus, Aug. 9, 48. Pompeius' army was utterly routed, and Pompeius himself fled to Egypt, where he was treacherously murdered. See POMPEIUS.

No sooner had the news reached Rome than Cæsar was again appointed dictator for one year, and consul for five years. He was invested with tribunitial power for life, and with the right of holding all the magisterial comitia except those for the election of the plebeian tribunes. He did not, however, return to Rome after the battle of Pharsalus, but went to Egypt, then in a distracted condition on account of the disputes regarding the succession. Out of love for Cleopatra (said one tradition, which also declared that she bore him a son), he entered upon the "Alexandrine War," in which he was successful, and which he brought to a close in March, 47. He next overthrew Pharnaces, King of Bosphorus, son of Mithridates, near Zela, in Pontus, August 2 of the same year, and arrived in Rome in September. He was once more appointed dictator, and the property of Pompeius was confiscated and sold. Before the close of the year he had set out for Africa, where his campaign against the Pompeian generals, Scipio and Cato Uticensis, was crowned with victory at the battle of Thapsus, April 6, 46. Cato committed suicide

at Utica; and with such irresistible celerity was the work of subjugation carried on, that by the end of the summer Cæsar was again in Rome. Now occurred that display of noble and wise generosity which proves Cæsar to have been possessed of a great, magnanimous nature. He was not a man that could stoop to the vulgar atrocities of Marius or Sulla, and so he majestically declared that henceforth he had no enemies, and that he would make no difference between Pompeians and Cæsarians. His victories in Gaul, Egypt, Pontus, and Africa were celebrated by four great triumphs, during which the whole Roman populace was feasted and fêted by the magnificent liberality of the dictator.

He now proceeded to check, by wholesale enactments, as far as in him lay, the social evils which had long flourished in the city. During the year 46, also, he conferred a benefit on Rome and on the world by the reformation of the calendar, which had been thrown into great confusion by the Pontifical College for political purposes. In the meanwhile Pompeius's sons, Gnaeus and Sextus, were in arms in Spain. Cæsar overwhelmed their forces at Munda (March 17, 45). He now received the title of "Father of his Country," and also of *imperator*; was made dictator and *præfectus morum* for life, and consul for 10 years; his person was declared sacred and even divine; he obtained a bodyguard of knights and senators; his statue was placed in the temples; his portrait was struck on coins; the month Quintilis was called Julius in his honor; and on all public occasions he was permitted to wear the triumphal robe. He now proposed to make a digest of the whole Roman law for public use, to found libraries, to drain the Pontine marshes, to enlarge the harbor of Ostia, to dig a canal through the Isthmus of Corinth, and to quell the inroads of the barbarians on the eastern frontiers. In 49 he had given Roman citizenship to Gallia Transpadana: in 45 he had carried through the *Lex Julia Municipalis*, which dealt with the internal organization of Rome, and, perhaps, the Italian towns generally, especially with police, sanitary and traffic arrangements. Consult Hardy, *Six Roman Laws, Translated with Introduction and Notes* (Oxford, 1911). But in the midst of these vast designs he was cut off by assassination, on the Ides (15th) of March, 44. The details of this crime—the greatest disaster that could have befallen the Roman world, as subsequent events made plain—are too familiar to require narration. It is sufficient to say that of the 60 aristocrats who were in the conspiracy, many had partaken of Cæsar's generosity, and all of his clemency. A few, like Brutus, out of a weak and formal conscientiousness, based on theory rather than insight, were probably shocked by Cæsar's desire to change the form of government into an hereditary monarchy, and by the fact that he was all too willing to have divine honors paid to him, a practice Oriental rather than Roman; some, probably, were inspired by a jealous hatred of the dictator, and the base ambition of regaining power at all hazards.

Cæsar was of a noble and kingly presence, tall of stature, and possessing a countenance which, though pale and thin with thought, was always animated by the light of his black eyes. He was bald-headed (at least, in the latter part of his life) and wore no beard; though of a rather delicate constitution naturally, he ultimately

attained the most vigorous health. His besetting sin was sensuality; but without meaning to detract from the criminality of his conduct in this respect, it may be said that it was as much the sin of the times in which he lived as his own, and that the superlative grandeur of his position gave a prominence to his licentiousness which a more humble lot would have escaped. His intellect was marvelously versatile. In everything he excelled. He was not only the first general and statesman of his age, but he was, excepting Cicero, its greatest orator. As an historian he has never been surpassed and rarely equaled in simplicity and vigor of style and in the truthfulness with which he narrates events of which he was an eyewitness. He was, moreover, a mathematician, philologist, jurist, and architect, and always took great pleasure in literary society. Most of his writings have been lost, though their titles are preserved; yet we still possess his invaluable *Commentarii* (generally known as 'Caesar's Commentaries on the Gallic and the Civil Wars'). The *editio princeps* was printed at Rome (1449). The *Commentarii De Bello Gallico*, in 7 books, published in 51 B.C., describe the campaigns in Gaul through 52; an eighth book, by Aulus Hirtius, gives the events of 51-50. The *Commentarii De Bello Civili* describe Caesar's struggle with Pompeius. Caesar wrote also an *Anticato*, a pamphlet directed against Cato Uticensis, and a work *De Analogia*, a grammatical treatise, in which he appeared as an analogist. (See ANOMALISTS AND ANALOGISTS.) These are now lost. The style of the *Commentarii* and Caesar's powers as an orator are very highly praised by Cicero (*Brutus*, 252-261).

Caesar's life was formally written in ancient times by Suetonius and Plutarch. Much information can be gained also from his own *Commentarii*, from Cicero's letters, and orations (such as the *Pro Marcello* and the *Pro Ligario*), from Lucan's *Pharsalia*, and from Asinius Pollio, Livy, Velleius Patereulus, Appian, Florus, Eutropius, and Dio Cassius. There are extant also works called *Bellum Alexandrinum* and *Bellum Hispaniense*, not by Caesar (by Hirtius?), which give accounts of Caesar's campaigns in Africa and Spain. The materials thus given have been worked up by Drumann, *Geschichte Roms*, vol. iii (as edited by Groebe, 1906), and, with great care, by E. G. Sihler, in *Annals of Caesar: A Critical Biography with a Survey of the Sources* (New York, 1911), revised and republished as *C. Julius Caesar: Sein Leben nach den Quellen kritisch dargestellt* (Leipzig, 1912). Sihler takes issue vigorously with the works of Mommsen and Froude, mentioned below, for partisan support of Caesar. Consult also Mommsen, *Römische Geschichte* (8th ed., 1888), book v (Eng. trans., vol. iv, 1894); Delorme, *César et ses contemporains*, etc. (Paris, 1868); Napoleon III, *Histoire de Jules César* (Paris, 1865-66), which deals especially with the Gallic campaigns, incorporating the results of excavations; Colonel Stoffel, *Histoire de Jules César: La Guerre Civile* (Paris, 1888); Froude, *Caesar: A Sketch* (London, 1879; 2d ed., 1896); Fowler, *Julius Caesar and the Foundation of the Roman Imperial System* (New York, 1892); Dodge, "Caesar," in *Great Captains Series* (Boston, 1892); Merivale, *The Roman Triumvirates* (London, 1887); Holmes, *Caesar's Conquest of Gaul* (2d ed., Oxford, 1911); Holmes, *Ancient Britain and the Invasions of Julius Caesar* (Ox-

ford, 1907); Ferrero, *Greatness and Decline of Rome*, vol. ii (Eng. trans., New York, 1907); Tyrrell's edition of the *Correspondence of Cicero*, introduction to vol. v; Scott, *Portraits of Julius Caesar* (London, 1903); Roper, "The Likenesses of Julius Caesar," in *Scribner's Magazine* (1887); Veith, *Geschichte der Feldzüge O. Julius Cæsars* (1906); Holmes-Schott-Rosenberg, *Cæsars Feldzüge in Gallien und Britannien* (Leipzig, 1913), a condensation of the two works by Holmes named above.

CÆSAR, GARDENS OF. A tract on the southern slope of the Janiculum at Rome, laid out by Julius Caesar in terraces supported by colonnades, with artificial glens and waterfalls. The site commanded an extended view. No remains above ground are now extant, but the spot has yielded a number of important works of art. The gardens were given to the people by Caesar's will.

CÆSARE'A IN CAPPADOCIA, kâp'pâ-dō'shî-â. See KAISARIEH.

CÆSARE'A (Gk. Καῖσάρεια, *Kaisareia*) **PAL'ESTINÆ**. An ancient seacoast town of Palestine, on the site of which is the modern El-Kaisariyeh, 32 miles north of Jaffa (Map: Palestine, B 2). It was built by Herod the Great and named in honor of Augustus Caesar. The site was originally called Strato's Tower. Herod made here a magnificent harbor by constructing a strong breakwater (the ruins of which still remain) on which he lavished vast sums of money. The town was built at great expense, with an amphitheatre, temples, and other like structures (Josephus, *Ant.* xv, 3-5, 9-6; xvi, 5-1). Its water supply and drainage system were of unusual excellence. It became the military capital of Palestine, where the Roman procurators had their headquarters. It is noted in New Testament history as the place where Peter preached the Gospel to Cornelius, the first Gentile convert to Christianity (Acts x.), and as the scene of Paul's two years' imprisonment (Acts xxiii. 33; xxiv. 32). In the great war with Rome, 66-70 A.D., Cæsarea suffered the almost total extermination of its Jewish inhabitants. Here Vespasian had his headquarters and was proclaimed Emperor, 69 A.D. Soon after he constituted it a Roman colony. After the fall of Jerusalem (70 A.D.) it became the metropolis of Palestine. During the early Christian centuries Cæsarea continued to be a place of importance. Pamphilus, pupil and friend of Origen, had here a famous library (third century). Eusebius, the father of church history, was Bishop of the place 315-318. The town was conquered by the Moslems in 638. The Crusaders captured and plundered it in 1102. Among the booty they found, it was claimed, the Holy Grail. (See GRail, THE HOLY.) It was taken by Saladin in 1187, but recovered by the Crusaders in 1191. Having been rebuilt on a smaller scale, it was finally destroyed by the Sultan Bibars in 1265. The modern place is only a village on the ancient site.

CÆSAREA PHILIPPI (Gk. Καῖσάρεια, ἡ Φιλίππου, *Kaisareia hē Philippou*). A city near one of the sources of the Jordan, 1150 feet above sea level, on the southern slope of Mount Hermon. There is no certain identification of it with any Old Testament place, though from very early times it was considered a sacred spot, and when the Greek domination was established over Palestine, the cult of its local deity was supplanted by the worship of Pan, to whom the neighboring grotto, from whose springs the Jor-

dan source waters flow, was dedicated (Josephus, *Ant.* xv, 10, 3; xviii, 2, 1). It came thus to be known as *Panivm*, or *Panias*, a name which has survived in the modern *Bāniās*. About 20 B.C. the Emperor Augustus gave this region to Herod the Great, who built a temple of white stone near the old Greek sanctuary, dedicating it to his benefactor. On Herod's death the place became a part of the tetrarchy of his son Philip, who enlarged the city, calling it Cæsarea in honor of Tiberius (Josephus, *Wars*, ii, 9, 1), and adding to it his own name, to distinguish it from the Cæsarea founded by his father on the coast. Under Agrippa II the name of the town was changed to *Neronias* in honor of Nero. But after the fourth century the old name *Panias* persisted, and has outlived the others, in the name of the modern town. It was captured by the Crusaders in 1130 and retaken by the Moslems in 1105. The Crusaders' castle occupies the summit of the hill behind the village. It was to the villages suburban to this city that Jesus came at the close of his period of retirement and instruction of his disciples and on the way there called upon them for a declaration of their conception of his Messiahship (Mark viii. 27-30, with Matt. xvi. 13-20).

CÆSAREAN (sē-zā'rē-an), or **CÆSARIAN, OPERATION** (Lat. p.p. *cæsus*, from *cædere*, to cut. Popularly, but in all likelihood erroneously, connected with *Cæsar*). A name which has from very ancient times been applied to the operation of delivering a child through an abdominal incision into the pregnant uterus instead of by way of the natural passages. The operation is of very ancient date. It is supposed to have been practiced by the Greeks, and Pliny mentions that Scipio Africanus and Manlius were born in this way. Children delivered in this manner were known as Cæsones, and from this the name Cæsar was subsequently derived as a family name.

A number of noted persons in history have had their names associated with the operation, as Æsculapius, Julius Cæsar, and Edward VI of England. In the case of the latter two, however, there seems to be very good evidence that birth was not accomplished in this manner.

There can be no question, however, that the operation was frequently practiced, and its performance was from time to time made a matter of statutory enforcement. Numa Pompilius decreed that every pregnant woman who died should be opened, and the Senate of Venice in 1608 decreed that practitioners should perform the operation, under heavy penalties, on pregnant women supposed to be dead. In 1749 the King of Sicily imposed the punishment of death upon a medical man who neglected to operate on a dying woman advanced in pregnancy.

During these earlier days in the history of the operation it seems to have been practiced almost solely upon women just dead or at the point of death, and to have had for its purpose the saving of the infant alone. The first case in which the operation was performed on a living woman occurred in 1491. Since this date many cases have from time to time been reported of both mother and child having survived the operation, and some of these under the most adverse circumstances. It is only since 1890, however, that the operation has come to take its place as a well-recognized surgical procedure in certain cases where delivery is impossible by natural means.

In brief, the operation is performed by making a vertical incision 6 or 7 inches long in the mid line of the abdomen over the pregnant uterus. When the uterus is exposed, it is drawn into the wound, incised from above downward, and the child and placenta rapidly removed. After this the incision in the uterus is carefully closed by sutures, and it is allowed to fall back into its place. The abdominal wall is then brought together after the usual methods of suture and a suitable dressing applied. A very small maternal death rate (5 per cent in cases operated upon before the onset of labor) attends the operation as at present practiced.

A modification of the Cæsarean operation, known as Porro's operation, removes the uterus after it is freed of its contents, thus obviating any possibility of a future pregnancy. Consult Kelly, *Operative Gynecology* (New York, 1898).

CÆSAR IN EGYPT. A tragedy by Colley Cibber, produced at Drury Lane in 1724 and published in octavo in the following year. Its sources are Beaumont and Fletcher's *False One* and Corneille's *Mort de Pompée*.

CÆSARIO, sē-zā'rī-ō. In Shakespeare's *Twelfth Night*, the name under which Viola, in the disguise of a page, enters the service of Orsino.

CÆSARISM, sē-zā'r-iz'm. A term applied to that form of absolute rule in which the functions of government are exercised by a single person in whom they have, presumably, been vested by the will of the people. Such a despotism was that of Julius Cæsar, resting on a basis of popularity purchased by the free distribution of bread and gratuitous admittance to the gladiatorial shows, or that of the two Napoleons with its recourse to pliable plébiscites.

CÆSARIUS, SAINT OF ARLES (?-543). Bishop of Arles. He was educated in the monastery of Lérins, was appointed in 502 to the episcopal chair of Arles, and introduced into his bishopric many needed reforms. His *Regulæ Duæ* were much used by the founders of orders, previous to the general adoption of the rule of Benedict. In 529, at the synod of Arausio (now Orange), he defended the Augustinian doctrines against the Semipelagians. Consult Arnold *Cæsarius von Arlate und die Gallische Kirche seiner Zeit* (Leipzig, 1894).

CÆSARIUS OF HEISTERBACH, his'tēr-bāg (c.1170-c.1240). A German preacher and historian. He became a Cistercian friar in the monastery of Heisterbach and died as prior there. He wrote *De Miraculis et Visionibus sui Temporis* (Cologne, 1591), *Homilia* (ib., 1615), and other works. Consult Kaufmann, *Cæsarius von Heisterbach* (Cologne, 1850); Bethany, *Cæsarius von Heisterbach* (Elberfeld, 1896); Schönbach, *Ueber Cæsarius von Heisterbach* (Vienna, 1908-09).

CÆSARIUS OF NAZIAN'ZUS (?-368). A Christian scholar and writer of the fourth century. He was educated at Alexandria, went thence to Constantinople, where many dignities were conferred upon him, and was distinguished for his knowledge of mathematics and physics. He is credited with four dialogues in the Latin editions of St. Gregory, as also in the *Bibliotheca Patrum*; and Suidas says he wrote a work entitled *Contra Gentes*.

CÆSARODU'NUM (*Cæsar* + *Gadhel. dun*, stronghold, fort, AS. *dūn*, Eng. *down*, Latinized *dunum*). The ancient name of Tours, meaning 'Cæsar's Fort.'

CÆSARS, THE CITY OF THE. A legendary city of South America sought by many explorers of the sixteenth and seventeenth centuries. It is generally supposed to have been built by a member of the party of Sebastian Cabot, Cæsar by name, on the eastern slope of the Andes, near the middle western border of Argentina, in the second quarter of the sixteenth century. Another legend holds that it was founded by a shipwrecked Spanish crew, in the same locality and time.

CÆSAR'S HOUSEHOLD (Gk. *οἱ ἐκ τῆς Κασάρου οἰκίας*). A phrase used in the Epistle to the Philippians (iv. 22), where it designates a group of Christians whose greetings are sent to the church at Philippi. In its later and more developed usage this phrase referred to the Imperial household as embracing, not merely the immediate servants of the palace, but the whole list of the Emperor's attendants, including in its number persons of rank as well as freedmen and slaves. At the time when Philippians was written, however, the usage of the phrase was restricted, and denoted merely the direct servants and dependents of the Imperial establishment who were exclusively slaves or freedmen.

The purely incidental character of the reference in the Epistle indicates apparently that these members of the Emperor's household were known to parties in the church at Philippi, being perhaps originally from that neighborhood in the East. It may be, therefore, in spite of the fact that Philippians was written late in Paul's imprisonment, that these Imperial servants had been brought into the church before Paul's arrival in Rome, having possibly learned the Gospel in Philippi itself. At all events, they were more likely to have been of Grecian than of Latin origin—Greeks and Orientals being especially numerous in Nero's household. The names of some of the Imperial household of this period, as recovered from the *columbaria*, occur in the list of salutations in Rom. xvi. Consult J. B. Lightfoot, *Commentary on Philippians* (7th ed., 1883), and Th. Zahn, *Introduction to the New Testament*, Eng. trans., vol. 1, p. 550, note 1 (1909).

CÆSIUM, *sē'zī-ūm* (Lat. *cæsius*, bluish gray). A chemical element discovered spectroscopically, in 1860, by Bunsen and Kirchhoff. It is found in very small quantities in certain mineral waters and in a number of minerals, including lepidolite, petalite, and certain feldspars. The only mineral which contains considerable quantities of it is the rare mineral pollux, found on the isle of Elba, this mineral containing as much as 34 per cent of cæsium oxide. An American variety of pollux is found in greater abundance than the isle of Elba variety, but, as shown by Chabré in 1901, contains only 13 per cent of cæsium oxide. The preparation of metallic cæsium involves the complete separation of its compounds from those of the other elements (iron, aluminium, the alkaline earths, and especially potassium and rubidium) that may be present in the given source; further, the transformation of the pure cæsium compound obtained into the cyanide, and, finally, the electrolytic decomposition of the cyanide. The pure metal is very similar to potassium and has a great avidity for oxygen, readily taking fire if exposed to the air. It is white, with a metallic lustre, has a specific gravity of 1.89, and melts at 26.5° C. (79.7° F.). Its chemical symbol is Cs; its atomic weight,

132.81. Its spectrum shows two characteristic lines in the blue part.

CÆSTUS. See CESTUS.

CAETANI, *kā'a-tū'nē*, MICHELANGELO, DUKE OF SERMONETA (1804-82). An Italian student of Dante, born in Rome. He was made Minister of Police under Pius IX, and after Italian unity was effected, a member of Parliament. In 1865 he became totally blind. He is best known for his commentaries on the *Divina Commedia*, including *Della dottrina che si asconde nell' ottavo e nono canto dell' Inferno* (1852), *La materia della Divina Commedia* (1865), and *Tre chiese nella Divina Commedia* (1876).

CĀF, *kāf*, **KĀF** (or more properly, QAF). The mountain, or range of mountains, which in Arabic and Persian fiction surrounds the earth. The pivot on which the mountain rests is a great emerald from which the sky receives its colors, and the mountain is the dwelling place of giants and genii. "From Kāf to Kāf" signifies "from one end of the world to the other." The name "Kāf" is sometimes applied also to the Caucasus Range.

CAFÉ PROCOPE, *kā'fā' prō'kōp'*. See PROCOPE CAFÉ.

CAFFA, *kāf'fā*. See KAFFA.

CAFFARELLI, *kāf'fā-rēl'lē*, GAETANO MAJORANO (1703-83). An Italian vocalist, a *castrato* who was deemed the first soprano of the age. He was highly successful for many years, having no rival, excepting, possibly, Farinelli.

CAFFEINE, *kāf'ē-in* or *-ēn*, **THEINE**, *thē'in* or *-ēn*, or **GUARANINE**, *gwā-rā'nīn* or *-nēn* (Brazil) (from Neo-Lat. *caffea*, coffee), $C_8H_{10}N_4O_2 + H_2O$. An alkaloid found in tea, coffee, and other vegetable products. It is a solid substance, crystallizing in long, flexible, colorless needles, which melt at 236.8° C. (458° F.). It combines with the strong mineral acids to form salts, such as the hydrochloride of caffeine—which, however, decompose almost completely when dissolved in water. Pure caffeine is odorless, has a bitter taste, and is permanent in the air. If its solution in chlorine water is evaporated to dryness and the remaining residue redissolved in dilute ammonia water, a beautiful violet-red coloration is obtained. By this reaction the presence of caffeine may be detected in samples submitted for examination. Caffeine may be extracted from tea by treatment with hot water and the subsequent addition of lime; the mixture thus obtained is evaporated to dryness, and the caffeine is dissolved out of the residue with chloroform. It may be prepared from coffee by the following process. The coffee is extracted with water; the solution is precipitated with lead acetate and filtered; sulphuretted hydrogen is passed into the filtrate to eliminate the excess of lead acetate added; the solution is then rendered more concentrated by evaporation and is neutralized with ammonia; on cooling, crystals of caffeine separate out, which may be purified by recrystallization from water. The amount of caffeine found in tea and coffee varies with the product—coffee usually contains less than 1 per cent, while amounts varying between 2 and 4 per cent have been found in different samples of tea. The alkaloid is supposed to exist in these products in combination with tannic acid and potassium. Caffeine has absolutely no nutritive value. If taken in moderate quantities, it has the effect of increasing the blood pressure and of stimulating the cerebrum, thus increasing the reasoning power and the imagination; it is

even believed to increase the powers of muscular endurance. Larger quantities, however, are liable to cause trembling of the muscles, and toxic doses have the effect of paralyzing the heart. The symptoms of caffeine poisoning are buzzing in the ears, flashes of light, a heavy feeling in the head, restlessness, insomnia, a rapid and feeble pulse, coldness of surface, and rise of central temperature. Even moderate quantities of tea and coffee are in some persons liable to cause irregularity of the heart. Therapeutically caffeine is used to combat certain forms of nervous and cardiac depression, certain headaches and neuralgias, gout, the insomnia of alcoholism, and opium narcosis. It is also used as a diuretic. Caffeine was discovered in coffee in 1820 and in tea in 1827 (theine); in 1838 Jobst proved the identity of caffeine and theine. In recent years Emil Fischer succeeded in producing the substance artificially and in 1897 demonstrated conclusively the chemical constitution of caffeine, showing that the substance is closely allied to uric acid as well as to the alkaloid theobromine, and is to be represented by a constitutional formula first proposed for it by Medicus in 1875. See ALKALOIDS.

CAFFER BREAD. See KAFFE BREAD.

CAFFETANNIC ACID. See TANNIN.

CAFFI, kăf'fê, IPPOLITO (1814-66). An Italian genre, landscape, and battle painter. He was born at Belluno and studied at the Venice Academy, where many of his best works were executed. He also lived in Rome and traveled extensively in Africa and the East. He took part in the revolution of 1848 and finally lost his life on the battleship *Re d'Italia* during the naval battle off Lissa (1866), in which he had participated in order to prepare a picture of the conflict. His color effects and management of perspective and detail are admirable. Among his principal paintings are the often repeated "Carnival in the Piazzetta, Venice," a night scene with moonlight and fireworks effect; "View of the Corso at Rome" (Modern Gallery, Rome), and "The Isthmus of Suez." Many of his works are in the Museo Civico, Venice. Consult his biography by Codema-Gerstenbrand (Venice, 1868).

CAFFIN, CHARLES HENRY (1854-1918). An American art critic, born at Sittingbourne, Kent, England. After graduating from Oxford in 1876 he was engaged in scholastic and theatrical work. In 1892 he came to the United States, worked in the decoration department of the Chicago Exposition, and after moving to New York in 1897, was art critic of *Harper's Weekly*, of the *New York Evening Post*, and of the *New York Sun* (1901-04). His publications include: *Photography as a Fine Art* (1901); *American Masters of Painting* (1902); *American Masters of Sculpture* (1903); *How to Study Pictures* (1905); *Story of American Painting* (1907); *Story of Spanish Painting* (1910); *Story of French Painting* (1911); *Art for Life's Sake* (1913). His writings are of a popular rather than scholarly character.

CAFFRARIA. See KAFFRARIA.

CAFFRE CAT. See CAT.

CAFFRISTAN, kăf'frê-stăn'. See KAFIRISTAN.

CAGAYÁN, kă'gá-yăn'. The christianized Malayan people who live near the Río Grande de Cagayán of north-central Luzon are collectively known by this name. Their principal dialect is Ibanag. See PHILIPPINES.

CAGAYÁN, RÍO GRANDE DE. See RÍO GRANDE DE CAGAYÁN.

CAGE BIRDS. The practice of keeping birds in captivity for the enjoyment of their songs, or for entertainment from their habits, or for admiration of their beauty, dates back so far that we have no knowledge of its origin. It existed among the nations of Asia before the time of Alexander, and it is said that elaborate bird cages of ivory and gold were among the extravagances of Rome. When the islands of the Pacific Ocean were first visited, parrots were found captive among nearly all the tribes, and the natives of tropical countries generally capture and keep birds alive about their dwellings. In civilized countries at the present time, great numbers of birds are so kept, and thousands are annually imported into America in addition to many native favorites. Birds are captured for the market both by means of nets and with birdlime, but more commonly the young are taken from the nest and artificially reared. Many cage birds, however, breed well in captivity, and such species are often reared in great numbers. A notable instance of this is the common canary, which, although a native of the Canary Islands, is bred in Europe, especially in the Harz Mountains, where the raising of fine canary songsters is an important cottage industry. The bird has become considerably modified under these conditions, and those reared for cage purposes differ markedly from the wild individuals in their native islands. The question of the ethics of keeping birds in captivity has recently been discussed not a little, but this is hardly the place to enter into the subject. Suffice it to say that the conditions under which the bird is kept, and its early history, profoundly modify the case. There can be no doubt that a canary bred in captivity, whose ancestors were captives and which has never been at liberty, is far better off in a cage, if properly cared for, than if it were free, while it is equally true that to confine in a cage an adult bird which has known the use of its wings and learned to get its own living is wanton cruelty.

Cage birds may be roughly classed as song birds, talkers, and plumage birds. Of song birds the canary is undoubtedly the most popular and best known, but the nightingale, bulfinch, goldfinch, and several European thrushes, the mocking bird, cardinal, and brown thrasher of North America, and the bulbuls and dyals (magpie robins) of India, are other widely known species whose beauty of song has brought them into captivity, not only in America, but in nearly all parts of the civilized world. Of the talkers the number of species is comparatively small, the best known being several species of parrot, the starling, and the myna bird of India. The plumage birds are legion, but are chiefly from the tropics, though a few are from warm-temperate regions, as the summer redbird, or tanager, of the southern United States. The parrakeets and love birds, the painted finches, the cockatoos, and some large parrots and macaws are good examples of brilliant color, while the whydah bird is one of those which are kept for some oddity of plumage. Birds differ greatly in their ability to stand captivity, especially when that involves a marked change of climate. Insectivorous birds are the most difficult to keep, not only because of the difficulty of furnishing suitable and sufficient food, but because under normal conditions the obtaining of their food

requires great activity, and the sedentary life of a cage reacts unfavorably. Grain-eating birds are usually easily kept because the change in their lives is not so great. But it is not wholly a matter of food, for though parrots are easily supplied with food many die in the early days of their captivity. Indeed, it is said that 95 per cent of the African gray parrots brought to Europe die before they have been taught to speak. With these birds, however, it is probably largely a matter of climate, the low temperatures, and especially the sudden and marked changes of temperature, proving too much for their tropical natures. In the United States it is better to purchase parrots in the spring and let them enjoy the natural heat of summer out of doors, guarding carefully against sudden changes. The best parrot for talking purposes is probably what is known as the double-fronted, yellow-faced Amazon, the *Chrysotis ochrocephala* of ornithologists. This is a South American species, but is hardy both in America and Europe. Parakeets and love birds cannot be taught to speak, but their gentle habits and beautiful plumage make them great favorites. The cockatoos and great macaws are only with great difficulty taught to speak and never make good talkers. They are noisy birds and disagreeable in other ways, but their great beauty induces many people to keep them.

Management. In keeping any bird in captivity, it should be the constant endeavor to make the surrounding conditions as natural as possible. When free, all birds are scrupulously clean; even the worst carrion eaters keep themselves clean from dirt of every kind. Therefore cleanliness in the cage is one of the first matters to be attended to, and this is obviously of special importance when the attractive feature of the bird consists of remarkably developed plumes, like some of the tail feathers of the whydah bird. The cage should be large enough so that the bird may move about freely and change its positions easily without injuring its tail feathers or any plumage ornaments. The perches should always be of soft, unpainted wood and not too slender. The bird should have plenty of light, except at night; artificial light is almost certainly injurious, and cages in illuminated rooms should be veiled. The cage ought not to be in direct sunlight except in winter, and even then for only a comparatively short time. Water should be given a bird plentifully and ought to be always fresh. Most birds enjoy a bath, and opportunity should be frequently given for a bird to wash itself; the basin should be shallow or else have a dark interior, or gravel on the bottom, so that the bird may judge the depth of the water. After a bath the bird should be placed in the sun until dry. Occasionally, if possible, let the bird out of the cage and permit it to exercise in the larger freedom of a room or similar inclosure. Most birds need to be protected from sudden changes, draughts, and extremes of temperature, so that the cage ought not to hang near an open window or a door likely to be opened, except, perhaps, on still summer days; but fresh air is a prime necessity for most birds, and artificial heat, especially if very dry, is usually injurious. Owing to lack of exercise, by which they can be worn away, the nails and sometimes the bills of captive birds become so overgrown as to be a serious detriment to the health; therefore opportunity for scratching ought to be provided in the shape

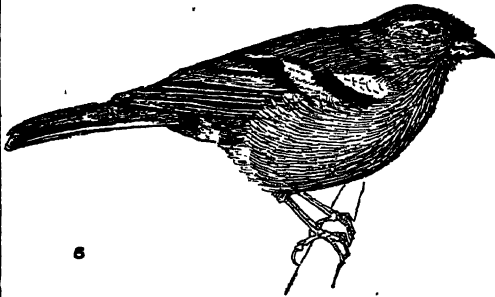
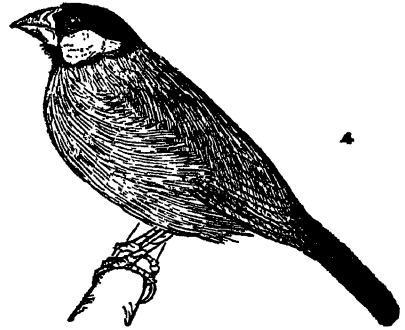
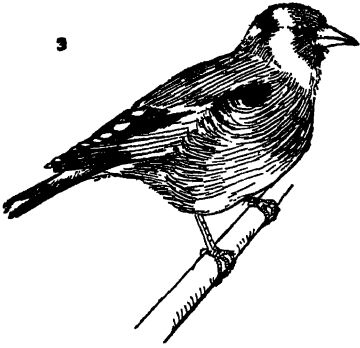
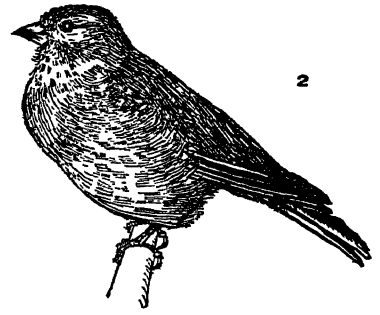
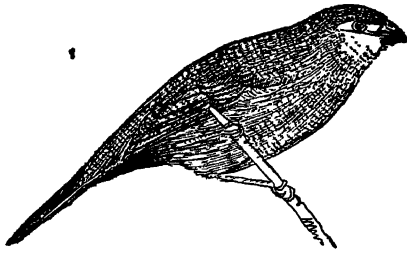
of sand or heavy sandpaper, while for the bill a piece of cuttlefish bone or some similar substance should be attached to the sides of the cage. Birds should never be unduly alarmed. Like all other animals, they deserve and will repay perfect kindness and gentleness in their treatment.

Food. Most of the ailments of cage birds come from an improper diet. The food may not be of the right sort, or it may be too scanty or too abundant. Few, if any, cage birds are exclusively insectivorous, but even those which normally take much insect food also eat more or less vegetable matter. Insectivorous birds may be given meat when insect food is not abundant; a diet of spiders, roaches, meal worms, or flies is far better for the health of such birds. Nearly all cage birds will eat seeds, and as a universal bird food the seed of canary grass is unequalled. It may be mixed with rape and millet and even oats are sometimes used. Hemp should be used very sparingly, and as birds are very fond of it, a bird may be tamed by giving it a few grains in the hand from time to time. Even parrots like canary seed and are said to thrive on it; but sunflower seeds are preferable, and with an occasional apple or other ripe fruit, these birds will live for many years in perfect feather. Seed-eating birds, ought, however, to be given fresh vegetable matter sometimes, in the form of soft green leaves or fruit that is not acid. Such plants as chickweed and lettuce, put into the cage cool and fresh, are a valuable addition to the bird's diet. The greatest danger to birds is in overfeeding, underfeeding being very unusual. If a bird shows signs of ill health, it should, if possible, be placed in a fresh cage, in new surroundings, given rather less food and that of the simplest kind. The bird should be examined, and if an excess of yellow fat shows through the skin, the diet should be regulated accordingly. A drop of castor oil placed in the bird's mouth by means of a brush often proves beneficial, but the chief reliance should be placed on changed surroundings, quiet, and a simple diet.

Aviaries are outdoor inclosures in which birds are kept and reared in comparative freedom. They are common in the tropics and in England, but the harsher climate of the United States and other conditions have rendered them less popular here than is desirable. Aviaries, however, are really only large cages and governed by similar rules. The breeding of cage birds is a special department, instructions for which will be found in the books mentioned below. See CANARY; BUDGERIGAR; PARROT; BULFINCH, and the names of various other cage birds, under which detailed directions are given for their care.

Bibliography. Bechstein, *Cage and Chamber Birds* (London, 1864; a most complete work; colored plates); Greene, *Notes on Cage Birds* (London, 1899; illustrated); Dixon, *Dovecote and Aviary* (London, 1851); Holden, *Book on Birds* (Boston, 1875); Greene, *Diseases of Cage Birds* (London, 1897); Blakston, Swainsland, and Wiener, *Book of Canaries and Cage Birds* (London); Greene, *Parrots in Captivity* (London, 1884); Butler, *Foreign Finches in Captivity* (London, 1899); and *How to Sea Cage Birds* (London, 1907); Oldys, *Cage-bird Traffic of the United States* (Washington, 1907); Norman, *Aviaries, Bird-rooms, and Cages* (London, 1908); Birchley, *British Birds for Cages, Aviaries, and*

TYPICAL CAGE BIRDS



1. AMADAVAT (*Estrilda amandava*).
2. LINNET (*Acanthis cannabina*).
3. GOLDFINCH (*Carduelis carduelis*).

4. JAVA SPARROW (*Munia oryzivora*).
5. CHAFFINCH (*Fringilla coelebs*).
6. BULLFINCH (*Pyrrhula europaea*).

Exhibitions (London, 1909); Telling, *Practical Guide to Successful Cage-bird Culture* (London, 1909). The *Avicultural Magazine* and *Bird Notes* are two monthly magazines published in London devoted to the interests of cage and aviary birds. See Plate of CAGE BIRDS.

CAGLI, kă'lyé (anciently, *Callium*, *Calles* of the Sabinians). An episcopal city in central Italy, in the Province of Pesaro e Urbino, on the Burano, 76 miles west of Ancona by rail (Map: Italy, G 4). The cathedral is beautiful, and the church of San Domenico contains a Madonna and a Pietà by Giovanni Santi, Raphael's father. The town is very old and contains ruins that bear inscriptions showing that it was a Roman municipium. On a stream at the foot of the hill on which the town is built is an ancient bridge constructed of huge blocks of stone. There are silk factories here. Pop. (commune), 1881, 10,000; 1901, 11,927; 1911, 12,964.

CAGLIARI, kă-lyá'rè (anciently, Lat. *Cari-lis*). An archiepiscopal city of Italy, capital of the Province of Cagliari and of the island of Sardinia, at the southern end of which it is situated (Map: Italy, D 8). It is on the slope of a steep hill 300 feet high which overlooks the Gulf of Cagliari and is partially surrounded by extensive lagoons utilized for the manufacture of salt. The old section of the town, called the Castello, still has its ancient gates, towers, and walls, and contains the principal public buildings, palaces, and the cathedral, which was completed in 1312 by the Pisans. Below the ancient amphitheatre, which has seats hewn out of the living rock, are botanical gardens, containing remains of Roman reservoirs and subterranean watercourses. The university, founded in 1596 by Philip III of Spain, has about 270 students. Cagliari is the railway centre of Sardinia and is connected with the mainland by submarine cable and by regular steamboat service to Genoa. There are three theatres, and of the numerous festivals that of St. Ephesus is the most famous. The principal manufactures are firearms, powder, cotton goods, hats, and a kind of sweet cake. Shipbuilding is carried on, and grain, flax, wine, cheese, goatskins, and salt are exported, while the principal import is lumber. Pop. (commune), 1881, 30,000; 1901, 53,727; 1911, 59,606. Cagliari was founded by the Phœnicians.

CAGLIARI, PAOLO. See VERONESE, PAOLO.

CAGLIOSTRO, kă-lyô'strô, ALESSANDRO, COUNT (1743-95). An Italian impostor, whose real name was Giuseppe Balsamo. He was born in Palermo, of poor parentage, June 2, 1743. When 13 years old he ran away from a seminary where he had been placed, and was afterward sent to a monastery at Cartagiere. Here he became assistant to the apothecary of the monastery, and picked up that scanty knowledge of chemistry and medicine which, in an age at once skeptical and credulous, imposed upon so many respectable individuals. He left the monastery or was ejected, and for a time led "the loosest life" in Palermo. When 26 years old, he found it highly advisable to leave his native place. In company with a certain sage named Althotas, Cagliostro is vaguely represented as traveling in Greece, Egypt, and Asia. In Venice he married a very beautiful woman named Lorenza Feliciano, who became a skillful accomplice in his schemes and captivated many admirers, while Cagliostro swindled them. In Italy and Germany he posed as a physician,

philosopher, alchemist, Freemason, and necromancer, and did a lively business in his "elixir of immortal youth." He was not so successful in St. Petersburg at the court of the shrewd Catharine II. From St. Petersburg he went to Warsaw, where he grew rich on titled dupes in spite of being exposed. In 1780 he was in Strassburg, later in Paris, then in England, and in 1785 again in Paris, where he was lodged in the Bastille for his share in the affair of the Diamond Necklace (q.v.). His plausibility secured his liberation, and he went to England, but there and elsewhere he found little scope for the continued exercise of his peculiar talents, and he returned to Italy in 1789. He had established a spurious Egyptian, Masonic rite, and his continuance in this work in Rome led to his condemnation by the Inquisition. His sentence of death was commuted to life imprisonment, and he died in 1795. His wife ended her days in a convent.

Bibliography. In *Notes and Queries*, fourth series, vol. x (London, 1872), appeared a Cagliostro bibliography by William E. A. Axon, who had just written (1871) a series of papers on Cagliostro for the *Dublin University Magazine*. Consult: in Thomas Carlyle's *Miscellaneous Essays*, "Count Cagliostro"; *The Life of Count Cagliostro* (London, 1787); *The Life of Joseph Balsamo, Commonly Called Count Cagliostro*, etc. (London, 1791); also Trowbridge, *Cagliostro; the Splendor and Misery of a Master of Magic* (New York, 1910). Much spurious material has appeared concerning Cagliostro's life. Such are the so-called *Mémoires authentiques* (Paris, 1786).

CAGNAT, kă'nyá', RENÉ LOUIS VICTOR (1852-). A French classical archæologist, born in Paris. He was appointed professor of Roman epigraphy and antiquities at the Collège de France in 1895, and is the author of *Etude historique sur les impôts indirects chez les Romains* (1882); *Explorations épigraphiques et archéologiques en Tunisie* (1883-86); *L'Armée romaine d'Afrique* (1892); *Recherches et découvertes archéologiques dans l'Afrique du Nord* (1892); *Découvertes nouvelles en Tunisie* (1896); *Cours d'épigraphie latine* (3d ed., 1898), and various other archæological and epigraphical works.

CAGNOLA, kă-nyô'la, LUIGI, MARCHESE (1762-1833). An Italian architect, born in Milan. His master works are two triumphal arches built at Milan by order of Napoleon—the Porta di Marengo (later known as the Porta di Ticino) and the famous Arco della Pace, begun in 1807, but not finished until 1838. This is one of the largest structures of the kind in Europe; it is 78 feet high and is surmounted by a bronze figure of Peace, in a car drawn by six horses. Besides these may be mentioned the Campanile at Ugnano and the chapel of Santa Marcellina in the basilica of Sant' Ambrogio, Milan.

CAGOT, kă'gô', also known as CAGOTS, CAQUEUX, COLLIBERTS, etc. An alien or outcast people living chiefly in the Pyrenees of southern France and extreme northern Spain. Their origin is unknown. They have been thought to be descendants of the Visigoths, but are more probably autochthones concentrated in a sterile and rugged land by pressure from more progressive peoples without. Except that they are sedentary, their habits and customs are not unlike those of the gypsies (q.v.). Before the French Revolution they were regarded as Ishmaelites

and often treated as heretics or lepers, their relations with neighboring peoples affording a most notable example of the persistence of primitive race sense into modern times. Cretinism, goitre, and various deformities and incapacities are exceptionally common among them; by some they are thought to be distinguished by the absence of the lower lobe of the ear; and these peculiarities have aided in holding contemporaries aloof from them. Since 1790 they have been recognized as citizens. Their language is a blend of neighboring tongues with a few peculiar terms and forms.

CAGSAUÁ, kǎg'sá-wá', or **DARAGA**. A town of Luzon, Philippines, in the Province of Albay, situated 2 miles north of Albay. Much hemp is grown in the vicinity. Pop., 1903, 18,695.

CAGUAS, kǎ'gwás. A community of Porto Rico, in the municipality of the same name, 22 miles south-southeast of San Juan on the great military road (Map: Porto Rico, E 2). It has public schools, a church, and an asylum for the poor supported by the local government. In the heart of the tobacco region, its chief industry is the manufacture of cigars. Marble and limestone are quarried near by. Pop., 1899, 5450; 1910, 10,354.

CAHABA, ká-hǎ'bá, or **CAHAWBA**. A river rising near Birmingham, in Jefferson Co., Ala., flowing nearly south through a region rich in coal, and joining the Alabama River at Cahaba, 10 miles southwest of Selma (Map: Alabama, B 3). The Cahaba is navigable for small craft for nearly 100 miles.

CAHAN, kǎ'hán, **ABRAHAM** (1860-). A Russian-American writer of Hebrew descent, born at Podberezye, in the Government of Vilna, Russia. While apprenticed to learn a trade, he prepared himself for school and finally took a course at the Teachers' Institute of Vilna. He began teaching on graduation, but in 1882, incurring the suspicion of the government by participation in the revolutionary movement, emigrated to the United States. Here he became active in the labor movement and gradually rose to the leadership of one of the Socialist parties—that represented by the Jewish daily called the *Forcárts*, of which Cahan became editor in 1901. His literary activity began in 1884 with articles appearing in American newspapers, chiefly sketches or stories of Jewish life. They attracted immediate attention to their author. He contributed essays and stories to the *Arbeiterzeitung*, a Socialist Jewish periodical, and for a time was editor of this paper. The bulk of his writing is necessarily journalistic. His published works include *Yekl*, a Tale of the New York Ghetto (1898), regarded as a true picture of East Side Jewish life, and *The White Terror and the Red* (1905), a story of revolutionary Russia under Alexander II. In Yiddish have appeared *Raphael Naarizoch* (1907), *Ein Historie von die Vereinigte Staaten* (2 vols., 1910-12), and *Yiddish Folksongs with Original Airs Collected from Oral Traditions* (1912).

CAHENS'LYISM. A name given to a plan proposed in 1891, attributed to Herr Cahensly, the secretary of the St. Raphael Society for the protection of German immigrants to this country, to place the foreign-born Catholic population under bishops and priests speaking the same language and of like race. It created much controversy among Roman Catholics and was vigorously opposed by Cardinal Gibbons and

Archbishop Ireland. Herr Cahensly, who visited this country in 1893, emphatically denied all connection with the proposed plan. Meantime the increasing immigration to the United States has compelled the formation of parishes on national lines, with priests speaking the language of their people, so that French, Polish, and Italian churches are now common.

CAHILL, THADDEUS (1867-). An American inventor, born in Iowa. He studied at Oberlin College in 1884-85 and later in various laboratories. Although admitted to the bar in 1894 after a law course at Columbian (now George Washington) University, he never practiced. He devised the electric typewriter, but his most notable achievement was the invention of a process of producing music electrically by means of alternators or dynamos transmitting vibrations from a central station to receiving telephones. (See *TELHARMONIUM*.) A company was organized to exploit the invention, but was unable to do it with success. In 1900 Cahill was given the degree of D.C.L. by George Washington University.

CAHOKIA MOUND. See *ILLINOIS INDIANS*.

CAHORS, kǎ'ör' (anciently, Lat. *Cadurcum*, from the Celtic tribe *Cadurci*; earlier *Divona*, 'the sacred source'). A town of France, capital of the Department of Lot, and seat of a bishopric, situated on a small, rocky peninsula, formed by a bend of the river Lot—here crossed by three bridges—about 60 miles north of Toulouse (Map: France, S., F 4). It consists of the upper and lower city, and among its antiquities are the fine Romanesque cathedral, the ruins of a Roman temple and aqueduct, and tower of the ancient royal palace (fourteenth century). There are also a monument of Fénelon, who studied at Cahors, and statues of Gambetta, who was born at Cahors, and of Clément Marot. Among the institutions are a library, a girls' school, and a museum. It has manufactures of cotton yarn, woollens, leather, paper, glass, and farming implements, foundries, and establishments for the preparation of *pâté de foie gras* and other delicacies; the district produces a famous red wine which bears its name. Pop., 1901, 11,738; 1911, 13,650. Cahors was a prosperous city under the Romans, and in the thirteenth century was an important centre of finance and had a colony of Lombard bankers.

CAIAPHAS, kǎ'yá-fas. A high priest of the Jews, appointed by the Roman procurator, Valerius Gratus, in the reign of Tiberius Cæsar. He was in office at the time of the trial and crucifixion of Jesus, but was removed by Vitellus A.D. 37 (Josephus, *Ant.*, xviii, 2, 2; 4, 3). His wife was the daughter of Annas, a former high priest (7-14 A.D.). The chief priests were at this time largely Sadducees, and it is to be noted that in the trial of Jesus and subsequent persecution of the Apostles they were more prominent than the Pharisees. In a general council summoned to take action upon the spread of the doctrines of Jesus, Caiaphas is represented in the Fourth Gospel as being decidedly in favor of putting him to death, using this language: "Ye know nothing at all; nor do ye take account that it is expedient for you that one man should die for the people, and that the whole nation perish not" (John xi. 50; he "prophesied," according to verse 51; cf. xviii. 14). Jesus was arraigned in the court of the high priest, and when the effort to convict him through the testimony of witnesses who are

designated by Matthew (xxvi. 60) and Mark (xiv. 56, 57) as false, failed, the prisoner was called as a witness and asked if he was indeed the Christ, Son of God. According to Matt. xxvi. 64 and Luke xxii. 67-70, he only answered, "Thou sayest it," which is regarded by many scholars as meaning, in the light of the ordinary usage of the term, "That is what thou sayest, not I," consequently as either a denial of Messiahship or an unwillingness to commit himself. Only Mark (xiv. 62) declares that he said, "I am." The high priest is said to have been sorely grieved at what he considered blasphemy, and appealed to those present whether that was not enough. The answer was that Jesus deserved death, and, according to Matt. xxvii. 1, the sentence was ratified at a formal meeting of the Sanhedrin on the following morning. The high priest, however, did not have the power of final condemnation, which rested with the Roman authorities, to whom Jesus was accordingly handed over. Later Caiaphas persecuted the followers of Jesus (Acts iv. 6; v. 17). Consult Schürer, *Geschichte des jüdischen Volkes*, vol. ii (4th ed., 1907), pp. 258, 271; Schmidt, *The Prophet of Nazareth* (2d ed., 1907), pp. 286 f.

CAIBARIÉN, kǎ-bǎ'rě-ǎn'. A seaport on the north coast of Cuba, in the Province of Santa Clara. It has some coastwise trade in sugar and sponge fisheries (Map: Cuba, F 4). Pop., 1899, 8,650; 1907, 10,053.

CAICOS (kǎ'kós) **ISLANDS** (Sp. *cayo*, rock, shoal, islet in the sea). A group of small islands at the southeastern extremity of the Bahamas, lying between lat. 21° and 22° N. and long. 71° and 72° 30' W. (Map: West Indies, E 2). Though geographically a portion of the Bahamas and formerly under the government of Bahama, they form with Turk Islands a separate government under the governor of Jamaica. There are, including the Turk groups lying southeast, more than 30 small islands, having an area of less than 200 square miles, but only six are inhabited. The largest is Grand Caicos, which is 20 miles long by 6 broad. The seat of government is at Grand Turk. The chief industry is salt making, and a considerable amount of salt is exported annually to the United States, Canada, and Newfoundland. There is also a sponge fishery, while hemp is cultivated in West Caicos. Pop., 1904, 5300; 1911, 5615.

CAIËTA. See **GAËTA**.

CAIFA, kǎ'fǎ, or **HAIFA**, hǎ'fǎ. A seaport of Syria, on the Bay of Acre, lying upon a spur of Mount Carmel (Map: Palestine, C 2). Since the establishment of direct steam connection with Europe and the completion of the railway line from Damascus, it has grown rapidly in commercial importance and promises to be a strong rival of Acre, over which it has the advantage of a safe harbor. Grain and oil are exported. There are a number of missionary schools, and not far from the town is a settlement of German Templars, established there since 1869. Pop., about 12,000, of whom 6000 are Mohammedans.

CAILLAUX, kǎ'yô', JOSEPH (1863-). A French public official, born at Mans, France. He studied law, but early entered politics, becoming inspector of finances in 1888. Four years later he was appointed a professor in the Ecole des Sciences Politiques. He was first elected deputy for Sarthe in 1898 and, being reelected in 1902 and 1906, was in the latter

year chosen Vice President of the Chamber. Between 1899 and 1911 he was thrice Minister of Finance—in the cabinets of Waldeck-Rousseau (1899-1902), Clemenceau (1906-08), and Monis (1911). In July of 1911 he became Premier and Minister of the Interior, his cabinet vigorously supporting the old conservative parliamentary order. For his hostile attitude towards the railroad strikers he was so violently attacked by the Socialist deputies, and in addition was so severely censured for his secret conduct of the Franco-German negotiations regarding Morocco, that he resigned with his cabinet, Jan. 10, 1912. Within two years (Dec. 8, 1913) Caillaux was for the fourth time Minister of Finance, this time in the cabinet formed by Doumergue; but he had scarcely held the portfolio a month before Gaston Calmette (q.v.), editor of the *Figaro*, began a campaign to drive him from office in disgrace. Calmette charged that Caillaux, while Premier, had used the influence of his office to obtain large campaign contributions and that he had caused the postponement of the trial of Henri Rochette, indicted for swindling, in order to enable him to escape to Mexico; and on March 13, 1914, the *Figaro* published a letter said to have been written by Caillaux in 1901 while Minister of Finance, as evidence that he had conspired to defeat the income tax while pretending openly to support it. On March 16 Caillaux's wife shot and killed Calmette in the latter's office. Caillaux immediately resigned. See the article **FRANCE**, paragraphs on *History*.

CAILLETET, kǎ'ye-tǎ', LOUIS PAUL (1832-1913). A French chemist and ironmaster, born at Châtillon-sur-Seine. He studied at the School of Mines in order to engage in the iron industry in his native town. In addition to his business interests he devoted himself to the study of chemistry and worked on original researches, paying especial attention to metallurgical investigations and the liquefaction of gases. In 1877 he succeeded in liquefying both oxygen and nitrogen. For this work he was honored by election to the Académie des Sciences, first (1877) as a corresponding member and then (1884) as a full member. In 1889 he was appointed an officer of the Legion of Honor. A few days after Cailletet's discovery Raoul Pictet (q.v.), a Swiss chemist, succeeded in obtaining the same result by another method.

CAILLAUD, kǎ'yô', FRÉDÉRIC (1787-1869). A French traveler. After visiting southern Europe, Asia Minor, and Egypt, he was engaged by Mehemet Ali to explore the deserts along the Nile and near the Red Sea. On this voyage he discovered the emerald mines of Mount Zabara. He returned to France with a valuable collection of antiquities, plants, and minerals, and published *Voyage à l'oasis de Thebes* (2 vols., 1821). He went again to Egypt and made explorations in 1821-22 in the eastern deserts, accompanying Ibrahim Pasha on his expedition of conquest to Sennar. Among the relics of antiquity brought by him to France and purchased by the government was a mummy, inscribed with hieroglyphic characters accompanied by a Greek translation, which proved of great help to Champollion in the study of the ancient language. He published: *Voyage à l'oasis de Syouah* (1823), *Voyage à Méroé* (1826-27); *Recherches sur les arts et métiers, les usages de la vie civile et domestique des anciens* (1837).

CAILLÉ, kǎ'yǎ', RENÉ AUGUSTE (1799-

1838). A French traveler. He was born at Mauzé, Deux-Sèvres, and early in life became a traveler in Africa, supporting himself by trade with the Moors, from whom he learned Arabic. He dressed as an Arab and passed as an Egyptian. He penetrated as far as Timbuktu in 1828 and for this exploit received a prize of 10,000 francs from the Geographical Society of Paris, besides a pension of 1000 francs and admission to the Legion of Honor. His notes of travel, arranged by M. Jomard, were published under the title *Journal d'un voyage à Tombouctou et à Jenné dans l'Afrique centrale* (3 vols., 1830).

CAIMACAM, kî'mâ-kâm', or **KATMA-KAM** (Turk. *qâimaqâm*, Ar. *qâ'im*, *maqâm*, literally, substitute from *qâ'im*, standing, *scil.* in another's + *maqâm*, place). A Turkish officer corresponding to lieutenant colonel in the army, or lieutenant governor in the civil service. The Caimacam of Constantinople is the lieutenant of the Grand Vizier, whom he represents in processions. Such officers also act as governors in the principal towns.

CAIMAN, kâ'man. See **CAYMAN**.

CAIN. According to Genesis iv., the first-born son of Adam and Eve. He became a husbandman and offered to God of the fruits of the ground, while his brother Abel, who was a shepherd, offered the fat parts of some of his first-born lambs. Abel's sacrifice was accepted and Cain's rejected, which angered him. He was then told by God, either that sin lay crouching as a beast at his door and should be controlled, or, perhaps more probably, that to be forgiven he must present as a sin offering an animal near at hand which he had power to give. But he said to his brother, "Let us go into the field," and, when they were there, slew him. Cain did not look for death at the hands of God as a penalty for his murder, but feared that he might be driven away from the cultivated land, far from the presence of God, i.e., from the protection of a sanctuary. God indeed drove him into the land of Nod, but also relieved his fears by appointing for him a sign "lest any one finding him should smite him" and by assuring him that, if any one slew him, he would be sevenfold avenged. In the land of Nod he had a son with his wife and built a city which he named after his son Enoch. Cain is regarded by many modern scholars as the eponym of the Kenites, whose life in the eastern Negeb (q.v.) between the Jerahmeelite cities and the Dead Sea and the Arabah (q.v.) seemed to the settled Judeans as the punishment for a crime against a brother tribe. (See **ABEL**.) They were supposed to have been once cultivators of the soil, but their vegetable offerings, natural to their mode of life, not being so pleasing to the Deity as the bloody sacrifices offered by the tribe leading an ideal pastoral life, they were regarded as having been driven into the wild and sterile region they inhabited. In the desert, away from the settled land where the shrines furnish asylums for the manslayer, only the blood feud prevents the wanderer from falling a victim to the first man who meets him. The Kenites seem to have exacted seven lives for one lost of their own tribe. As for the sign by which they are protected, it is generally supposed to be a tribal mark. Stade thinks of an incision on the forehead; others have suggested circumcision. Cheyne regards Cain, the city builder, as a different figure from the Kenite eponym. The reference to the building of a city has the appearance

of being an addition to the text; but the assumption of two Cains seems unnecessary, as there were cities in the Kenite Negeb (1 Sam. xxx. 29) whose origin had to be accounted for. This interpretation is regarded as obviating the difficulties felt by Philo, and many readers since, as to where Cain got his wife, how the first murderer could be so lightly punished, why the execution of the fratricide should be avenged sevenfold, and for whom the only surviving son of the first man could be building a city. Consult Stade, "Das Kainszeichen" in *Zeitschrift für alttestamentliche Wissenschaft*, vol. xiv, pp. 250 ff. (1884); Driver, *Book of Genesis* (1904); Gordon, *Early Traditions of Genesis* (1907); Cheyne, "Cain" in *Encyclopædia Biblica*; Schmidt, *Messages of the Poets*, pp. 290 ff. (1911); Gunkel, *Genesis* (3d ed., 1913).

CAIN, kân, **AUGUSTE NICOLAS** (1822-94). A French animal sculptor. He was born in Paris, studied under Guionnet and Rude, and became well known for his depictions of animal life, in particular of large birds and beasts of prey. Among these may be cited, "Eagle Defending its Quarry" (1852); "Lion and Ostrich" (1874; Luxembourg Gardens); "Combat between Two Tigers" (1878); "The Ox" (Trocadéro); "Tiger and Crocodile" (Tuileries Gardens); "Rhinoceros Attacked by Tigers." His most ambitious work was the monument of Duke Charles of Brunswick for Geneva—an equestrian statue, two lions and a griffin in red marble. He bequeathed to the city of Paris a bronze group, "Eagle and Vulture Fighting over the Carcass of a Dead Bear," erected in the Square of Montholon.

CAIN: A MYSTERY. A tragedy by Lord Byron, begun at Ravenna, July 16, 1821, completed September 9, and published in December of the same year. It deals with the biblical tale of the fraternal jealousy, the temptation by Lucifer, and the final murder and expulsion from Eden. It is remarkable as an extremely ingenious appeal for sympathy with the title character.

CAINE [THOMAS HENRY] HALL (1853-). An English novelist and dramatist. He was born at Runcorn, Cheshire, of Manx descent, and now makes his home on the Isle of Man. Most of his books deal with Manx characters and subjects. He was an architect in early life, but became a journalist. During the last year of Rossetti's life Mr. Caine lived with him, and in the same year (1882) published *Recollections of Rossetti*. He visited Canada and the United States in 1895-96 to promote the international copyright movement. Among his other publications are: *The Shadow of a Crime* (1885); *The Deemster* (1887); *The Bondman* (1890); *The Scapegoat* (1891); *The Manxman* (1894); *The Christian* (1897); *The Eternal City* (1901); *The Prodigal Son* (1904); *Pete* (1908); *The White Prophet* (1909). A rather free discussion of religion in *The Eternal City* caused its rejection by Pearson's as immoral, after part of it had already appeared in that magazine in serial form. Both *The Eternal City* and *The White Prophet* were dramatized, but the latter, because it places the British army in an unenviable light, came under the ban of the English censor. Both plays were immensely successful. In 1913 Caine published the novel, *The Woman Thou Gavest Me*.

ÇA IRA, sâ é'râ' (Fr., it will go, equivalent to our 'it's all right'). A French Revolutionary

song, the words by Ladre, a street singer, and the melody originally a popular *carillon* by Bécourt, and a favorite air of Marie Antoinette. The song is said to have been first sung when the mob marched to Versailles, Oct. 5, 1789. At the beginning of the Revolution, when all France was wild over Liberty, Equality, and Fraternity, the song ran,

"Ah, ça ira, ça ira, ça ira.
Celui qui s'élève, on l'abaissera;
Celui qui s'abaisse, on l'élèvera";

but later, when the fierce passions began to stir, came the refrain, *Les aristocrates à la lanterne*. The song was banned by the Directoire in 1797.

CAIRD, KÄRD, EDWARD (1835-1908). An English educator and philosophical writer. He was born in Scotland and was educated at Glasgow and Oxford universities. He was professor of moral philosophy at Glasgow University for 38 years and, succeeding Dr. Benjamin Jowett, was master of Balliol College, Oxford, from 1893 to 1906. His published works include: *The Critical Philosophy of Immanuel Kant* (1889); *Essays on Literature and Philosophy* (1892); *The Evolution of Religion* (1893); *Lay Sermons and Addresses* (1907); *Essays on Literature* (1909). Consult W. O. Lewis, *The Fundamental Principles Involved in Dr. Edward Caird's Philosophy of Religion* (1909).

CAIRD, JOHN (1820-98). A minister of the Established church of Scotland and one of the most eloquent preachers in Great Britain. He was born at Greenock, on the Clyde, Dec. 15, 1820. He studied at the University of Glasgow, and in 1845 was ordained to the pastorate of the church of Newton-on-Ayr, whence in 1847 he was transferred to Lady Yester's, Edinburgh. Here his popularity was extraordinary, but the demands made on his physical energies were so great that he found it necessary to retire to the country, and accepted, in 1849, the country charge of Errol in Perthshire. A sermon which he preached before the Queen in 1855, in the church of Crathie, and which was published, by royal command, under the title of *Religion in Common Life*, was universally admired throughout Great Britain, translated into German, and published on the Continent under the auspices of Chevalier Bunsen, who wrote a preface to it, and suddenly carried the fame of the author into all parts of the Protestant world. In 1857 Dr. Caird accepted a call to Park Church, Glasgow. In 1862 he was appointed professor of divinity, and in 1873 principal of Glasgow University. In religion he was broad church, in philosophy idealistic. He published *Introduction to the Philosophy of Religion* (1880; 2d ed., 1900); *Spinoza* (1880); posthumously appeared, edited by his brother, E. Caird, *University Sermons* (1898); *University Addresses* (1898); *The Fundamental Ideas of Christianity* (with Memoir, 2 vols., 1899). He died at Greenock, July 30, 1898.

CAIRN, kârn (Gael. *carn*, heap of stones). In archæology, a name applied to a heap of stones erected over a grave or over a body not otherwise buried, or as a landmark. Among advanced peoples cairns are commonly used to mark stations of exploration or survey; among primitive peoples a mystical meaning commonly attaches to such structures. See **ARCHÆOLOGY**.

CAIRNES, kârnz, JOHN ELLIOTT (1823-75). An Irish economist. He was born at Castle Bellingham, county Louth, Dec. 26, 1823, and

was educated at Trinity College, Dublin. He studied law and was admitted to the Irish bar, but passed most of his time in writing for the press, chiefly upon economic questions affecting Ireland. In 1856 he was appointed professor of political economy in Dublin, and the next year his professorial lectures were published under the title *Character and Logical Method of Political Economy*. He next wrote for *Fraser's Magazine* a series of essays on the gold question, induced by the sudden increase of supply from California and Australia. In 1859 he was appointed professor of political economy and jurisprudence in Queen's College, Galway. In 1862 he published his works on *The Slave Power*, in which he warmly advocated the course of the Northern States, from the standpoint of the economist fully aware of the superiority of free to slave labor. His conclusions were to a large extent verified by the results of the war. In 1866 he was appointed professor of political economy in University College, London. From 1860 till his death, which occurred on July 8, 1875, he suffered greatly in health, and this of necessity restricted his powers of production; nevertheless, this was the period in which he wrote his chief work, *Some Leading Principles of Political Economy, Newly Expounded* (1874). Though in the main an adherent of the school of J. S. Mill, Cairnes exhibited at all times an original genius and a capacity for rigid logical deduction which enabled him to restate many of the principles of Mill in a more tenable form. In respect to method, Cairnes treated political economy as almost a pure science, with little concern for the practical application of its principles. He wrote in defense of the Wages Fund theory, after Mill had abandoned it. Among his other contributions to the science of economics may be mentioned his keen analysis of the subject of cost in production, and of value as affected by the limits of free competition.

CAIRNGORM, kârng'gôr'm'. A brown or yellow variety of quartz found in the district of Cairngorm, southwest of Banff, Scotland, whence its name. The color was formerly considered due to the presence of a small quantity of iron or manganese oxide, but it is now believed to be caused by some nitrogenous organic compound. Besides Scotland, cairngorm is found in Brazil, Siberia, Spain, and in the United States, near Pike's Peak, Colo., and in Burke and Alexander counties, N. C. The yellow variety is sometimes called "false topaz" and "Scotch topaz," or "Spanish topaz," through its lacking the hardness and brilliancy of the true topaz. In Scotland the cairngorm is cut and used for making brooches, bracelets, pins, and it is a favorite ornament for the haft of the Highland dirk.

CAIRNS, kârnz, HUGH MACCÁLMONT, EARL (1819-85). An Irish statesman, born at Cuttra, county Down, educated at Trinity College, Dublin, and called to the bar in 1844. He became a member of the House of Commons for Belfast in 1852, Solicitor-General under Lord Derby in 1858, Attorney-General in 1866, and Lord Justice of the Court of Appeals in the same year. In 1868 he was Lord High Chancellor in the Disraeli ministry. Upon the return of the Conservative party to power, in February, 1874, he was reinstated and continued to exercise his official functions until April, 1880. In 1878 he received the title of Viscount Garmoyne, in the county of Antrim, and Earl Cairns. He was one of the finest parliamentary orators of recent

times, and several of his speeches are justly regarded as masterpieces.

CAIRNS, JOHN (1818-92). A Scottish divine. He was born at Ayton Hill, Berwickshire, and studied at the universities of Edinburgh (1834-35 and 1837-41) and Berlin (1843-44). He entered the Presbyterian Secession Hall in 1840 and was ordained to preach in 1845. He was minister of the United Presbyterian Church, Berwick-on-Tweed, from 1845 to 1876, when he removed to Edinburgh, where in 1879 he was appointed principal of the United Presbyterian Theological College. Among his published writings are the following: *Life of John Brown, D.D.* (1860); *Romanism and Rationalism* (1863); *Outlines of Apologetical Theology* (1867); *The Doctrine of the Presbyterian Church* (1876); *Unbelief in the Eighteenth Century* (1881); the articles "Schottland" and "Kirchliche Statistik" in the second edition of Herzog's *Realencyklopädie*; and the article "Infidelity" in the *Schaff-Herzog Encyclopædia*.

CAIRO, *ki'rô* (from Ar. *Misr el-Kāhira*, the victorious capital). The capital of Egypt and the largest city of Africa. It is situated near the right bank of the Nile, at an altitude of 62 feet above sea level and about 12 miles above its bifurcation into the Rosetta and Damietta arms, 150 miles southeast of Alexandria, and 80 miles west of Suez (Map: Egypt, C 1). It covers an area of 11 square miles, divided into separate quarters named after the nationality of the inhabitants, and is surrounded by a low wall. Notwithstanding modern improvements the Arabian quarters retain their Oriental character, the streets in that part of Cairo being narrow, crooked, and but few of them paved. The houses are mostly of stone, several stories high, and with window lattices of wrought iron. The modern portion of Cairo, called *Ismailieh*, is extending westward and southward. It is lighted by gas, has electric tramways, and is well laid out with broad avenues, fine squares, and a beautiful park on the Place Ezbekieh, occupying an area of over 20 acres and containing a number of gardens and amusement places. The Place Ezbekieh is the centre of modern Cairo and around it are situated the principal theatres, hotels, and consulates. The entire modern section dates from the period of French occupation, 1798-1801.

The chief interest of Cairo lies in its numerous mosques, of which some are regarded as the best specimens of Arabic architecture. The Gami-ibn-Tulun, erected about 879, is the finest. Its site is said to have been chosen on the spot where God was supposed to have conversed with Moses. It is square and surmounted by four minarets and a dome and has a court with a fountain in the centre. Its ornamentation shows traces of Byzantine influence. The Gami Amra is the oldest in Egypt, but only a small portion of it is left. It was built in 643, but the present structure dates from 827. The Gami Sultan Hassan was begun in 1356 and in point of splendor stands foremost among the mosques of Cairo. It is cruciform in the interior and contains a large number of pillars and beautiful hanging lamps. Its inner court has two fountains of singular beauty, and its dome is flanked by two minarets, the southern of which is said to be the highest in Egypt. Among other mosques may be mentioned that of Mehemet Ali, a structure of considerable architectural merit, recently built after Turkish models, with high

minarets of alabaster. The mosque of Kait Bey, built about 1475, is considered one of the finest architectural monuments in Egypt. Cairo has a number of tombs of caliphs and Mamelukes, some of which are of great size and finely built. The obelisks, once so numerous, have disappeared and now adorn various European and American cities. Among the palaces of Cairo is the viceregal residence situated within the citadel: the beautiful palace of Gesireh in the northwestern part of the city, now converted into a hotel; and the palace of Addin in the centre of the city, frequently occupied by the Khedive. The bazars of Cairo are extensive and well stocked, although inferior to those of Constantinople or Smyrna. The chief business street, Muski, has greatly decreased in importance. The citadel of Cairo is situated southeast of the city and affords a fine view; its strategical importance is greatly detracted from by the fact that it is dominated by the Jebel Mokattam.

As an educational centre, Cairo ranks high; its schools are attended by students from all parts of the Islamic world. Among its educational institutions the El-Azhar, or 'the Resplendent,' stands foremost, both in size and importance. It is situated in an old mosque and is surrounded by numerous smaller buildings, used for the accommodation of the 8000 students, of whom about 2000 live in the college. Its history can be traced as far back as 970, and it is considered the oldest university in the world. It has faculties of theology and jurisprudence and is maintained chiefly by endowments, no tuition fee being charged. The 200 members of the teaching faculties receive no compensation and are compelled to earn their living by private tuition or clerical labor.

The other educational institutions include schools of art and medicine, a veterinary and a polytechnical school, besides numerous missionary and Arab schools. The viceregal library contains about 50,000 volumes, including a number of very rare copies of the Koran.

Cairo is the residence of the Khedive and is the seat of the administration of Egypt. It has also an international court and consular representatives from all important countries. The manufactures of Cairo include metal articles, textiles, essences of flowers, etc. The city is a large centre of cotton industry, the products of which are sold in the Sudan and inner Africa. There is railway communication with Alexandria, Damietta, Suez, El-Merg, Heluan, and Upper Egypt. The population of Cairo and its suburbs was 654,476 in 1907, consisting chiefly of Fellahin, Turks, Copts, and Arabs, together with Nubians, Berbers, Abyssinians, Jews, and over 53,000 foreigners; 1917, 790,939.

Old Cairo, or Fostat, was founded in 640 by Amru, the conqueror of Egypt, on the site of his camp and near the old town of Babylon. It was the capital of the country till 973, when Gauhar, the general of the Fatimite Caliph Al Moez, founded to the north of Fostat the new town of Al Kahirah, the Victorious City; Saladin enlarged the boundaries of the town and surrounded it with walls. Throughout the Middle Ages Cairo was one of the chief centres of Mohammedan culture, and the emporium for the trade between Europe and the East. From 1798 to 1801 it was held by the French; it passed from them to the Turks, and through the Turks to Mehemet Ali, the founder of the pres-

ent ruling dynasty. Though much of its former greatness has departed, Cairo is still one of the great capitals of Islam, and the life within its walls presents a picturesque blending of the buoyant European civilization, as represented by the English and French residents, with the dreamy mysticism of the Oriental world. Consult: Reynolds-Ball, *The City of the Caliphs* (Boston, 1897); Penfield, *Present-Day Egypt* (New York, 1899); Kemeid, *Cairo and Egypt* (London, 1899-1900); Sladen, *Oriental Cairo* (ib., 1911); Reynolds-Ball, *Cairo of To-day* (ib., 1912).

CAIRO, kâ'rô. A city, port of entry, and the county seat of Alexander Co., Ill., at the junction of the Mississippi and Ohio rivers, 125 miles (direct) southeast of St. Louis, on the Illinois Central, the Cleveland, Cincinnati, Chicago, and St. Louis, the Mobile and Ohio, the St. Louis, Iron Mountain, and Southern, and the St. Louis Southwestern railroads (Map: Illinois, C 6). The Ohio River is crossed here by a railroad bridge 2 miles long, and 58 feet above high water, which cost \$2,500,000. Cairo contains a public library, Federal building, St. Mary's Infirmary, Bondurant Hospital, a government customhouse, and a United States marine hospital. It has considerable manufactures, chiefly products of lumber, pearl buttons, and harness, and has an extensive river trade, being an important market for lumber and the agricultural products of the Mississippi valley. There are also several flour and feed mills, grain elevators, and planing mills. Settled about 1837, Cairo was incorporated some 30 years later. It was expected to become a great commercial centre, and is the place described by Dickens in *Martin Chuzzlewit* as "Eden"; but, until it was protected by levees, begun in 1857 and constantly improved, it suffered from frequent inundations, the most disastrous of which occurred in 1858. In 1913 \$250,000 was appropriated by the State for the building and repair of levees within the corporate limits of the city. During the Civil War large quantities of military supplies were stored here by the Federal government. Cairo adopted the commission form of government in 1913. Land area, 1913, 1440 acres. Pop., 1900, 12,566; 1919, 14,548; 1920, 15,203.

CAIROLI, kî'rô-lê, BENEDETTO (1825-89). An Italian statesman, born at Gropello, near Pavia. He was educated at the University of Pavia, which he left in 1848 to volunteer in the war against Austria, and from 1851 to 1859 lived in exile in Piedmont, when he again took up arms for Italian liberty, serving at the siege of Palermo, in the Trentino, and at Monterotondo and Mutino. Though he favored a republic, he was induced to accept the constitutional monarchy. After the accession of Humbert I Cairoli became President of the Chamber, and was appointed Premier in March, 1878. On November 17, as the King was driving into Naples, a certain Giovanni Passanante attempted to assassinate him with a poniard, but was prevented by Cairoli, who was in the carriage, and who received a severe wound, while King Humbert escaped with a mere scratch. In December, 1878, the Cairoli ministry resigned. The Depretis ministry, which succeeded, was in turn defeated in 1879, and the Left again came into power under Cairoli, who was, however, forced to reconstruct his cabinet the same year and to bring in Depretis as Minister of the Interior. Finally, owing to the unpopularity of the policy

pursued in regard to the French expedition to Tunisia, the ministry resigned in 1881. Though retired from active political life, he received the knighthood of the Annunziata, two years before his death. From that time until his death Signor Cairoli was conspicuous as a leader of the so-called "historic" Left. Consult Lowell, *Governments and Parties in Continental Europe* (Boston, 1897); Underwood, *United Italy* (London, 1912).

CAISSON, kâs'sôn (Fr. augment of *caisse*, chest, Eng. case). A wheeled vehicle or ammunition carriage of which each field gun has from one to three or sometimes more attached thereto. Modern rapid-fire field guns require an enormous amount of ammunition as compared to the weapons of the last century, which accounts for the greater number of caissons now required. In the United States service, which may be taken as an illustration, the field battery of four guns has 12 caissons. The word *caisson* is used in two senses: (1) to designate the *caisson body*, a two-wheeled vehicle carrying one ammunition chest with a capacity of 70 rounds; (2) to designate the four-wheeled vehicle made up of the *caisson body* and the *limber* to which the six horses are attached. In the limber chest 36 rounds are carried, making a total of 106 rounds per caisson. Each caisson body is a two-wheeled vehicle having a limber interchangeable with that of the gun, and is arranged to be coupled up in trains when using traction engines or when moving empty to the rear. The tops of the caisson and limber chests are provided with hand rails, grip, and cushion straps so as to be used as seats by the cannoneers. On the under side of the chest are carriers for three oil cans. The weight behind the team with caisson fully loaded and limbered up is 4560 pounds. See ARTILLERY; FIELD ARTILLERY; LIMBER.

CAISSON. In engineering, a large water-tight box of timber, metal, or reinforced concrete with sides nearly or quite vertical, in which work may be done below water level, as in constructing the foundations of bridge piers, or the long columns in modern tall office buildings. The term may be applied also to a water-tight box employed to raise sunken vessels, to designate a boat gate for a dry dock, or a floating dry dock itself. Caissons may be divided into open caissons and pneumatic caissons. An open caisson is simply a water-tight box open at the top, in which the masonry foundation for a bridge pier or breakwater is to be built. It is constructed with sides up to 20 or more feet high. It is built either ashore and launched or afloat, and then towed to the site of the permanent work. After it is anchored in position the building of the masonry pier inside the caisson proceeds, and the caisson sinks until the top is nearly level with the surface of the water, when another section is added and the construction proceeds. Finally, it will rest either on the river bed or upon properly placed piles. After the masonry is brought to the desired height, the timbers constituting the caisson are removed. Reinforced-concrete caissons are used extensively in breakwater (q.v.) construction as a substitute for timber. By filling with concrete and building a reinforced cap of this material a practically monolithic structure of great strength is obtained which has been found useful in building breakwaters, quay walls, and piers.

The pneumatic caisson, as distinguished from

the open caisson, has no bottom, the edges of the sides resting directly on the surface. The upward extension of the structure is an open caisson within which the masonry is built on top, so that the weight causes the shoe, i.e., the lower edge of the vertical sides, to sink into the natural soil. In the working chamber, the floor of which is the bottom of the excavation, the roof the top of the caisson, and the walls the sides of the caisson, the material is excavated. From the working chamber, extending upward through the caisson and the masonry pier, is an air shaft, which affords the means of exit or entrance, while between the two is the air lock whose function is to retain the air pressure in the working chamber. Consult: Patton, *A Practical Treatise on Foundations* (New York, 1893); Fowler, *Ordinary Foundations* (New York, 1904, 1905); and for briefer treatment, Merriam, *American Civil Engineers' Pocket Book* (2d ed., New York, 1912). See FOUNDATION. See DOCK for description of caissons used with dry docks.

CAISSON DISEASE, DIVER'S PALSY, "THE BENDS." A nervous disorder, the chief symptom of which is temporary paralysis, which attacks workers under high atmospheric pressure, on their return to the surface. The disease was first observed by Trizius in 1839, in men working in compressed air in cylinders; and by Pol and Watelle in 1845 in miners. The most frequent form of paralysis is paraplegia, but hemiplegia sometimes occurs. The symptoms vary widely in severity, depending on the length of time spent under high pressure, the rapidity of decompression and on the physical condition of the worker. Only physically sound men, free from diseases of the blood vessels, heart, lungs, and kidneys, should be selected for work in caissons. The disease is not often fatal, but paralysis may last for days or months, or remain permanent.

Authorities are not agreed as to the ultimate causes of the phenomena which attend an attack of the "bends." Among many theories, two find wide acceptance at present. According to one, the so-called gaseous theory, the blood becomes overcharged with oxygen and carbonic-acid gas, which circulate therein as small bubbles, and which, endeavoring to escape through the lungs as pressure is relieved, either form emboli or penetrate into the surrounding tissues. The special effect of this pressure on the brain and spinal cord is due partly to their situation in closed bony cavities, and probably also to the delicacy of the nerve cells. When decompression takes place slowly, the gases have time to escape through the lungs, and evil effects are avoided. It has been shown experimentally by Seyler in 1855 and Paul Bert in 1872 that gas bubbles are produced in the blood of animals subjected to rapid changes in atmospheric pressure. According to the second theory, high pressure drives the blood from the surface to the deep organs, and especially to the cerebrospinal nervous system. Congestion ensues, followed by stagnation of the circulation. The blood vessels of the nervous system have little support, and do not readily recover their calibre and tone, so that stasis in the brain and cord lasts for a considerable time. Autopsy in recent fatal cases shows invariably congestion of the cord and brain; in later cases chronic softening of nerve tissues, such as occurs in myelitis.

In the treatment of caisson disease, morphia, heat, stimulants, strychnine, and ergot are recommended. Returning to compressed air for a time, and then emerging very slowly, is the common treatment. Prevention consists in increasing the time spent in "locking out" to one minute for every three pounds of pressure, thus avoiding a sudden transition from compressed air to the ordinary atmosphere pressure. Consult: Pol and Watelle, "Mémoire sur les effets de la compression de l'air," in *Annales d'hygiène publique et de médecine légale* (Paris, 1884); A. Gordon in Osler's *Modern Medicine*, vol. i (New York, 1907); Hill, *Caisson Sickness, and the Physiology of Work in Compressed Air* (London, 1912). See FOUNDATION.

CAITHNESS, kăth'nēs. The northernmost county of Scotland. Its area is nearly 697 square miles (Map: Scotland, E 1). The general aspect of Caithness is level and bare, it being in great part moorland and destitute of trees, while the seacoast is bold and rocky, with many bays, inlets, promontories, and caves. The chief crops are oats, barley, turnips, and potatoes. The occupants of the small farms divide their time between farming and herring, ling, cod, salmon, and lobster fishing. Wick, the county town, is the chief seat of the British herring fishery. Pop., 1801, 22,600; 1851, 38,700; 1891, 37,177; 1901, 33,860; 1911, 32,010. Consult Horne, *The County of Caithness* (London, 1907).

CAIUS, kēz, JOHN (1510-73). An English physician, the second founder of Gonville and Caius College, Cambridge. His real name was Kay, or Kaye, which he Latinized into Caius. He was born in Norwich, was educated at Gonville Hall, Cambridge, and, in medicine, at the University of Padua and elsewhere on the Continent, spending much time in search of accurate texts of Galen and Hippocrates. On his return he practiced at Cambridge, Shrewsbury, and Norwich. In 1547 he was elected a fellow of the College of Physicians, of which he was afterward nine times elected president. He also became physician to Edward VI, Queen Mary, and Queen Elizabeth. He acquired much wealth from the practice of his profession and employed it in the encouragement of science and learning. In 1557 he refounded Gonville Hall, thereafter known as Gonville and Caius College. In 1559 he was chosen master, and, although a Roman Catholic, retained office under Elizabeth. His books number 27 titles, including critical, antiquarian, and scientific works, the most famous of which is *A Booke of Counseill Against the Sweate and Sweatyng Sickness* (1552). Consult *Works of John Caius*, with a memoir of his life by J. Venn, edited by E. S. Roberts (New York, 1912).

CAIUS COLLEGE. See GONVILLE AND CAIUS COLLEGE.

CAIUS GRAC'CHUS. A tragedy by J. Sheridan Knowles, published in 1815 and produced at the Belfast Theatre, on February 13 of that year. Macready brought out a remodeled version on Nov. 18, 1823, at Covent Garden.

CAIVANO, kî-vă'nô. A city in the Province of Naples, south Italy, 5 miles north of Naples, with which it is connected by a street railway (Map: Italy, J 7). The chief trade is in the grain, hemp, fruit, wine, and olives that grow in the vicinity, and there are manufactories of lime, glass, and casks. It was a place of considerable strength in the Middle Ages and still retains re-

mains of walls and towers. Pop. (commune), 1881, 12,000; 1901, 12,264; 1910, 12,986.

CAIX, kă-eks', NAPOLEON (1845-1882). An Italian philologist. He was born at Bozzolo, near Mantua, and was educated in Cremona and Pisa. In 1869 he became professor of ancient languages at the Lyceum of Parma, and in 1873 professor of Romanic languages and comparative philology at the Institute of Higher Studies, Florence. The following are some of his numerous publications: *Saggio sulla storia della lingua e dei dialetti d'Italia* (1872); *Sulla lingua del contrasto* (1876); *Studi di etimologia italiana e romanza* (Florence, 1878), which, according to D' Ovidio, is a necessary complement to the lexicon of Diez; *Le origini della lingua poetica italiana* (1880), which work is generally considered his best. For his biography and bibliography, consult the memorial volume compiled in his honor in 1886, entitled *In memoria di Napoleone Caim e Ugo Angelo Canello, miscellanea di filologia e linguistica* (Florence, 1886).

CAJAMARCA, kă'nă-măr'kă. An interior department of Peru, in the northwestern part of the republic (Map: Peru, B 5). It has an area of 12,542 square miles, comprising a highly mountainous district which belongs to the basin of the river Marañon. Pop., 1906 (est.), 333,310. The department is noted rather for mineral wealth—principally gold, silver, copper, iron, and coal—than for animal or vegetable life, although there is considerable cattle raising. Cajamarca formed part of the Department of Libertad until 1854, when, as a result of the Revolution, it declared itself independent thereof. In 1855 the National Assembly approved the action, and a law of September, 1862, gave it legal existence.

CAJAMARCA, or **CAJAMARCA**, kă'hă-măr'kă (Quichua *ceassac, casac*, frost, ice + *marca*, place, town, referring to its severe climate). A city of Peru, capital of the department of the same name, situated on the east slope of the Andes, at an elevation of about 9400 feet above sea level; 84 miles from the Pacific coast and 350 miles north by west of Lima (Map: Peru, B 5). It enjoys a moderate temperature, is laid out with broad streets crossing at right angles, and contains several plazas. There are two fine churches, secondary colleges for both sexes, a prison of modern construction, and the ruins of the palace of Astopilco, where Atahualpa, the last of the Incas, was killed in 1533 by Pizarro. Cajamarca is one of the oldest cities of Peru, and figured prominently at the time of the Spanish conquest. Three miles to the east are the hot sulphur springs of Pultamarca, known as the Incas' baths. The most important manufactures are steel articles, cotton and woolen goods, and straw hats. Pop., about 9000.

CAJEPUT (Malay *kâyû*, tree + *putih*, white), *Melaleuca leucadendron*. A tree of the family Myrtaceæ, from the leaves of which the pungent, aromatic, volatile oil called oil of cajeput is obtained by distillation. The cajeput tree occurs from the Malay Peninsula to Australia, and is a tree 30 to 40 feet high and 2 feet in diameter, with a crooked trunk, papery bark, white wood (whence the name "cajeput"), elliptical, lanceolate, alternate leaves, and terminal spikes of white flowers. Almost all of the 100 species of *Melaleuca* are natives of Australia, some of them very beautiful shrubs and

frequent ornaments of British hothouses. Much of the oil of cajeput of commerce is prepared from *Melaleuca leucadendron*, but volatile oils similar in many respects are distilled from the leaves of many other species. A hundred pounds of leaves yield slightly less than one pound of oil. It is maintained by some that the true oil of cajeput comes only from *Melaleuca minor*, but that species cannot be distinguished from *Melaleuca leucadendron*. The oil contains a number of complex constituents, as cajeputol, hydrocarbons, various ethers, etc. It is a stimulant, counterirritant, diaphoretic, and antiseptic. In India it is used extensively as an external application for rheumatism. The oil is rather heavy and usually is of a greenish tinge. The wood is hard, close-grained, and durable, especially when placed under ground. The bark is useful for packing, etc. In Australia these trees are known as tea trees. *Melaleuca axillaris* produces a thin, spongy bark, that can be used for blotting and filter paper.

CAJETAN (Lat. *Cajetanus*) (1469-1534). An Italian ecclesiastic, whose real name was Giacomo de Vio (in religion Tomaso), the name "Cajetan" being assumed by him from his birthplace Gaeta (Cajeta). At the age of 15 he entered the Dominican Order, studied for the next few years at Naples, Padua, and Ferrara (where he held his own in a public disputation with Pico della Mirandola), and in 1508 became general of his order. Leo X made him a Cardinal in 1517, and in the following year sent him to Germany to urge the Emperor and the Scandinavian kings to form a league against the Turks. While on this errand he was commissioned to examine Luther personally, and send him to Rome if need were. Luther appeared before him at Augsburg, but refused to retract his teaching on indulgences, and his breach with the Church was only widened by the discussion. In 1523 Cajetan was sent as legate to Hungary; but Clement VII, on his accession, recalled him to Rome, in order to make use of his theological knowledge and counsel. He was consulted on the divorce of Henry VIII and decided unhesitatingly against it. While holding firmly to the authority of the Pope, he desired certain reforms in the Church. He made a translation of the Old Testament, with a commentary, and wrote a treatise on the authority of the Pope, which was answered by the faculty of the University of Paris. He also wrote commentaries upon parts of Aristotle's writings and upon the *Summa* of Aquinas. The latter is reprinted in the definitive edition of the great Aquinas issued under the patronage of Leo XIII (q.v.) (Rome, 1882). He died in Rome, Aug. 9, 1534. A collection of his works appeared at Lyons in 1639 (5 vols.); his life is prefixed. Consult, also, Schilbach, *De Vita ac Scriptis de Vio Cajetani* (Berlin, 1881).

CAJIGAL DE LA VEGA, kă'hê-gă'l' dă lâ vâ'gă, FRANCISCO ANTONIO (1695-1777). A Spanish colonial Governor, born in Hoz, Santander, Spain. He was Governor of Santiago, Cuba, from 1738 to 1747, and in 1742, during the war between Spain and England, repelled an attack of Admiral Vernon (q.v.). In 1747 he was appointed Governor-General of Cuba, which position he held until 1760, establishing a navy yard and arsenal at Havana during his term of office. From 1760 to 1761 he was a Viceroy of Mexico *ad interim*, and afterward, until his death, lived in Spain. He became Councilor of the

War Department (1761) and on the outbreak of hostilities with England in 1762 went to the front and fought in Portugal under the orders of the Count of Aranda. After the war he returned to the Council of War, whose dean he became in 1768.

CAJORI, ká-yó'ré, FLORIAN (1859-). An American mathematician, born at St. Aignan, Switzerland. He came to the United States in 1875 and was educated at the University of Wisconsin, at Johns Hopkins, and at Tulane. After serving as assistant professor and professor of mathematics at the last-named institution from 1885 to 1888, he became identified with Colorado College, as professor of physics and of mathematics (1903), and dean of the School of Engineering. His publications include: *The Teaching and History of Mathematics in the United States* (1890); *A History of Mathematics* (1895); *A History of Physics* (1899); *Introduction to the Modern Theory of Equations* (1904; 1912); *A History of the Logarithmic Slide Rule* (1909).

CAKCHIQUEL, kák'ché-kál'. An important tribe or nation, of Mayan stock, formerly holding the central districts of southern Guatemala, where their descendants still reside. The name is that of a native tree, and their language is a dialect of the Quiche. At the time of their conquest by Alvarado, about 1524, they had attained a high degree of culture, as is evidenced by their architectural remains, their calendar and hieroglyphic systems, and their native literary productions. They had an intense religious veneration for maize, and there is even reason to suppose that they were the first people to reclaim it from its original wild condition. The best compendium of their history and culture is Brinton's *Annals of the Cakchiquels* (Philadelphia, 1885). Consult also Stoll, *Zur Ethnographie der Republik Guatemala* (Zürich, 1884), and Thomas and Swanton, *Indian Languages of Mexico and Central America* (Washington, 1911).

CAKES, THE LAND OF. A title applied to Scotland, on account of the baps, scones, and oatmeal cakes which, with porridge, form the principal food of the country people. The epithet was prevalent in the eighteenth century.

CAKE URCHIN. See SAND DOLLAR; SEA URCHIN.

CALABAR BEAN, ORDEAL NUT. The seed of *Physostigma venenosum*, a twining, half-shrubby plant, native of western Africa, of the natural order Leguminosae, nearly allied to the kidney bean, but of a genus distinguished by the hood-shaped stigma and the deeply furrowed hilum of the seed. The bean itself is about the size of a large horse bean, with a firm, hard, brittle, shining integument, brownish red, pale chocolate, or ash gray in color; irregularly kidney-shaped, with two flat sides, and a furrow running longitudinally along its convex margin, ending in an aperture near one end of the seed. The kernel, consisting of two cotyledons, weighing about 46 grains is hard, white, and friable. It yields its virtues to alcohol and less perfectly to water. It is used in the form of an emulsion by the natives of Africa, as an ordeal when persons are suspected of witchcraft. It is believed that if the suspect vomits it he is innocent; if it is retained and death occurs, he is guilty. If the accused person is innocent, he will usually eat a large number without hesitation, and so cause vomiting; if

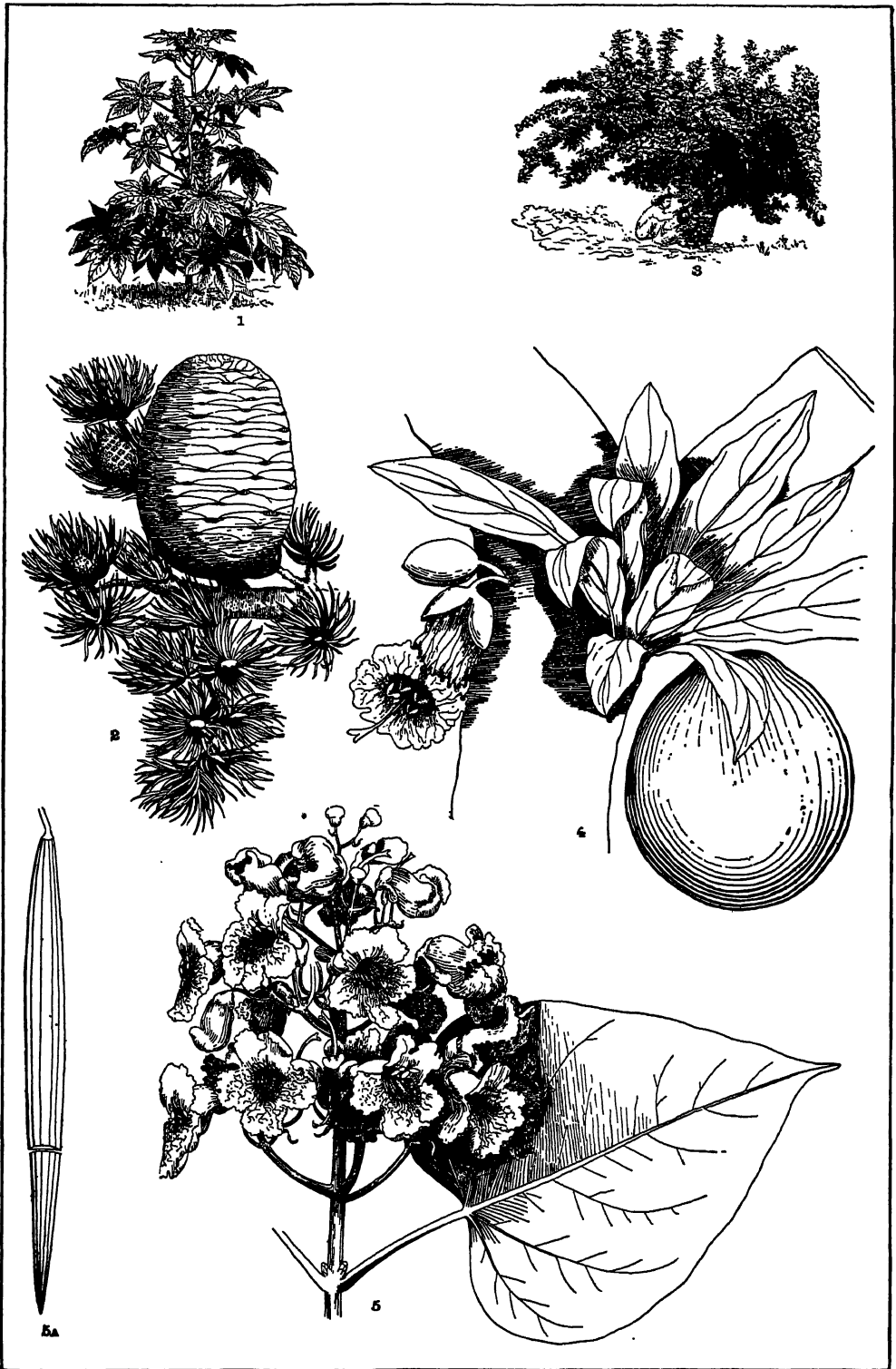
he hesitates and takes little, this does not occur. The bean contains two alkaloids—physostigmine, or eserine, which represents the chief activity of the drug and calabarine. In physiological doses physostigmine stimulates the secretion of the saliva, sweat, and tears; it stimulates also the involuntary muscles of the intestines, stomach, and bronchial tubes and diminishes the reflex activity of the spinal cord, being thus antagonistic to strychnine. Applied locally to the eye, it contracts the pupil, acting here as an antagonist to atropine (q.v.). In poisonous doses the activity of the respiratory centre in the cord and medulla is depressed or abolished, and death takes place from asphyxia. Physostigmine has been used medicinally in chorea, tetanus, and strychnine poisoning. It is employed in the form of the salicylate, to counteract the dilatation of the pupil caused by atropine, to lessen intraocular tension in glaucoma, and to alternate with atropine in breaking up adhesions in iritis.

CALABAR RIVER. An estuary-like bay on the north side of the Bight of Biafra, which penetrates British Nigeria just west of the border line between it and Kamerun (Map: Congo Free State, A 2). It is about 10 miles wide and extends inland nearly 25 miles. Near the head of the bay the waters of three rivers—the Cross, the Calabar, and the Akpa—are received through a deltoid borderland. The chief towns bordering the delta and estuary are Old Calabar, Duketown, and Creek town. The name "Old Calabar," employed in contradistinction to "New Calabar," a port and river 100 miles east, was officially replaced in 1904 by "Calabar."

CALABASH GOURD (Fr. *calebasse*, Sp. *calabaza*, a dry gourd; cf. Pers. *kharbuz*, melon, Little Russ. *harbuz*, pumpkin, watermelon), or BOTTLE GOURD (*Lagenaria vulgaris*). A climbing annual plant of the family Cucurbitaceae, cultivated in tropical countries. The angular leaves and the thin stem of the plant feel sticky to the touch and have a disagreeable odor. The odor of the white flowers resembles that of musk. The hard rind of the bottle-shaped fruit, called "calabash," is much used in tropical countries for holding liquids. The pulp of the common bottle gourd is worthless and cannot be used as an article of food. The calabash pipes imported from South Africa are made from the necks of these gourds. Other varieties of *Lagenaria*, however, bear an edible fruit, which is sometimes sweetened with sugar and offered for sale. For illustration, see Plate under CUUMBERS.

CALABASH TREE (*Crescentia cujete*). An evergreen tree found in the West Indies and in the tropical parts of America, belonging to the family Bignoniaceae. In height and size it resembles an apple tree, and has broad lanceolate leaves, tapering to the base; large, whitish, fleshy flowers scattered over the trunk and older branches; and a gourdlike fruit, sometimes a foot in diameter. The wood of the tree is tough and flexible and is well adapted for coach making. The most useful part is the hard shell of the fruit, after the outer skin is removed. Under the name of calabash, it is much used, in place of bottles, for holding liquids, and for goblets, cups, water cans, etc. These shells may even be used as kettles for boiling liquids. They are sometimes highly polished, carved with figures, tinged with various colors, and converted into ornamental vessels. The rinds of gourds

CALABASH, ETC.



1. CASTOR OIL PLANT (*Ricinus communis*).
 2. CEDAR OF LEBANON, CONE AND FOLIAGE (*Cedrus libani*).
 3. CALABASH TREE (*Crescentia cujete*).

4. FRUIT OF CALABASH TREE.
 5. CATALPA OR INDIAN BEAN TREE (*Catalpa bignonioides*).
 5a. CATALPA FRUIT OR INDIAN BEAN.

are sometimes similarly used and called calabashes.

CALABAZAR, ká'lá-bá-thár'. An inland city of Cuba, in the Province of Santa Clara, about 20 miles north by east of Santa Clara. It lies in the valley of the Calabazar River, just where it is spanned by the most pretentious piece of railroad bridge construction in Cuba. Pop., 1899, 1575; municipal district, 13,419; 1907, 1496; municipal district, 16,979.

CALABOZO, ká'lá-bó'só (Sp., dungeon). A town in Venezuela, capital of the state of Miranda, about 120 miles south-southwest of Carácas (Map: Venezuela, D 2). It is situated on the Guárico River, in the fertile grazing region of the great plains, and is an important commercial centre, with a trade in live stock, hides, cheese, timber, etc. Calabozo is the see of a bishop. The climate in this vicinity is excessively hot, and inundations are not infrequent. Calabozo was a humble native village until the early years of the eighteenth century, having been made in 1730 a trading station of the Compañía Guipuzcoana. Pop., about 6000.

CALABRIA (Gk. Καλαβρία, *Kalabria*). The southernmost peninsula of Italy, having the Ionian Sea and the Gulf of Taranto on the east, and the Tyrrhenian Sea on the west (Map: Italy, L 9). Its area is 5820 square miles. The surface is very mountainous, the peninsula being traversed through its entire length by the Apennine Mountains. Owing to its elevated surface, Calabria has a moderate and healthful climate. The flora is extremely rich and varied. The mountain slopes are covered with extensive forests of pine, oak, beech, and numerous other trees, interspersed with vineyards and olive gardens. Grain, rice, southern fruit, hemp, and flax are raised and exported in considerable quantities, and the raising of domestic animals is extensively engaged in by the inhabitants. Of mineral products Calabria yields marble, alabaster, gypsum, salt, and some copper. The compartimento is purely agricultural, the manufacturing industries being only slightly represented. There are very few large towns, and the railway lines run chiefly along the coast. For administrative purposes Calabria is divided into the provinces of Catanzaro, Cosenza, and Reggio di Calabria, with a population of 1,370,208 in 1901 and 1,402,151 at the census of June 10, 1911. The Calabrians are mostly plain folk, quite superstitious, and generally ignorant.

In Roman times the name "Calabria" was given to the southeastern peninsula of Italy, nearly corresponding to the modern Province of Lecce, no portion of which is included in modern Calabria, which answers to the ancient Bruttium. The name "Calabria," as applied to the district now known by that name, appears to have originated with the Byzantines, in the eighth century, after the Byzantines had lost to the Lombards the "heel" of the Italian peninsula (they still retained control of the "toe"). Before the unification of Italy Calabria constituted a province of the Kingdom of the Two Sicilies. On Sept. 8, 1905, an earthquake destroyed numerous villages and caused great loss of life. A still more disastrous earthquake was that of Dec. 28, 1908, by which Messina (q.v.) was destroyed. See REGGIO DI CALABRIA.

CALADIUM (Neo-Lat.; possibly from Scotch *kale*, *kail*, cabbage—a variant of *cole*). A genus of plants belonging to the family Araceæ (aroids). There are about a dozen

species, and numerous varieties that are cultivated in hothouses for their large, beautifully variegated, arrow-shaped leaves. They are closely allied to the Colocasias, which, in addition to being highly ornamental bedding plants, furnish the Taro (q.v.) of the Pacific islands. See ELEPHANT'S EAR and Plate of EDELWEISS.

CALÁGANE, ká-lá'gá-ná. A Malayan people on Dávao Bay, Mindanao. See PHILIPPINES.

CALAH. An Assyrian city mentioned in Gen. x. 12, and no doubt identical with Kalchu, which frequently occurs in the Assyrian inscriptions as the name of an important city. According to Asurnazirpal III (885-860 B.C.), Calah was built by Shalmaneser I (c.1320 B.C.). It was rebuilt by Asurnazirpal III in 880 B.C. He adorned it with a massive wall on the northern side, beautiful gardens along the banks of the Tigris, lofty temples, and huge palaces. In one of these palaces was found the "black obelisk," recording the tribute paid by "Jehu, the son of Omri," to Shalmaneser III (860-825). Building operations were carried on in Calah by Shalmaneser I, Asurnazirpal III, Shalmaneser III, Tiglath-pileser IV (745-728), Sargon (722-705), Esarhaddon (681-668), and Asur-ital-ilani-ukin (626-?). The largest zikkurat was 167 feet square and 140 feet high and had seven stages. During a number of reigns Calah was the residence of the court, but in population it probably never equaled Nineveh, or even Assur. It was the city that Layard discovered at Nimrud, 20 miles south of Kuyunjik, when he supposed that he had found Nineveh. Since very few tablets have been found at Nimrud, it has been assumed that Sennacherib (705-681) removed the temple library to Nineveh. Consult: Layard, *Nineveh and its Remains* (London, 1875); G. Smith, *Assyrian Discoveries* (London, 1875); id., *Chaldean Account of Genesis* (London, 1875); Winckler, *Geschichte Babylonien und Assyrien* (Leipzig, 1892); Rogers, *History of Babylonia and Assyria* (New York, 1901); Hilprecht, *Explorations in Bible Lands during the Nineteenth Century* (Philadelphia, 1903); Hommel, *Grundriss der Geographie und Geschichte des alten Orients* (Munich, 1904); Zehnfpund, *Babylonien in seinen wichtigsten Ruinenstätten* (Leipzig, 1913).

CALAHORRA, ká'lá-ór'rá (anciently, Lat. *Calagurris*, later *Kalatharral* of the Saracens, from Ar. *Kalat*, castle, and *harral*, stone). A town of Spain, in the Province of Logroño, Old Castile, 24 miles southeast of the city of Logroño, situated on the small river Cidacos, about 2 miles from its confluence with the Ebro (Map: Spain, E 1). It is the seat of a bishopric, and the cathedral is the principal building. The town has a brisk trade in local agricultural products. Pop., 1900, 9475; 1910, 9871. Calahorra occupies the site of the ancient Calagurris, and one may still see remains of an aqueduct and amphitheatre. Calahorra first became famous in 76 B.C., when the followers of Sertorius successfully defended it against Pompey. Four years later it gained a new celebrity for the obstinate but unsuccessful resistance it offered to Afranius, Pompey's legate, when the citizens slaughtered their wives and children for food rather than surrender. Calahorra was the birthplace of Quintilian, the rhetorician.

CALAIS, ká'lá' (ML. *Calaisia*, *Calaisis*). A seaport town and fortress of the first class in the Department of Pas-de-Calais, France, on the Strait of Dover, near its narrowest part, 20 miles

from Dover (Map: France, N., G 2). On the south and east, low, marshy grounds, which can be laid under water for the defense of the city, extend almost to the walls. The town, adjacent country, and port are commanded by the citadel, which is situated at the west end of the town, while seven forts, by their cross fire, defend the weakest points. The harbor, which was formerly shallow, has been greatly improved, has a lighthouse 190 feet high, and a port accessible to the largest vessels. As one of the chief ports of debarkation for travelers from England to France, it has frequent steam communication with Dover and London. The city is square in form; its streets are, for the most part, broad and well paved; and its ramparts form pleasant promenades. Among its objects of interest the most noticeable are the church of Notre Dame, the old Hôtel de Ville, and the Hôtel de Guise. It has become a manufacturing town of some importance. The chief manufactures are bobbinet (tulle), machine-made lace, hosiery, etc. A number of mills produce silk, wool, cotton, and linen goods, and hats and gloves are extensively made. Calais has also distilleries, salt refineries, and shipyards. Calais sends numerous boats to the herring and cod fisheries on the coasts of Scotland and Iceland. Its exports consist of eggs, corn, wine, brandy, etc., and it is the entrepôt for the produce of the district. It also does a large business in petroleum. In 1873 a school of artillery was established in Calais. It has an abundant water supply. Pop., 1896, 56,940; 1906, 66,627; 1911, 72,322.

In the ninth century Calais was a small fishing village. In the following century it was much improved by Baldwin IV, Count of Flanders, and enlarged and strengthened by the Count of Boulogne. In 1347, after a long siege, it was captured by Edward III of England, whose hard terms, and the self-devotion shown by six of the citizens, who were saved by Queen Philippa, form one of the most interesting passages of history. Under the English occupation Calais became a great trade centre, as location of the great wool "staple." The English retained it until 1558, when it was captured by the Duke of Guise, since which time (with the exception of two years, 1596-98, when it was in the possession of the Spaniards) it has remained in French hands. Consult: Calton, *Annals and Legends of Calais* (London, 1852); P. W. T., "Modern Calais" in *Nautical Magazine*, vol. lxvii (London, 1898); Aron and others, *Notice sur le Port de Calais* (Paris, 1904).

CALAIS, kál'is. A city and port of entry in Washington Co., Me., 120 miles by rail east-northeast of Bangor, on the St. Croix River, at the head of tidewater, and opposite St. Stephen in New Brunswick (Map: Maine, E 3). The most northeasterly seaport in the United States, it is the terminus of the Maine Central Railroad, has railroad communication by the Canadian Pacific through St. Stephen, with which it is connected by an international bridge, and has steamship connection with Boston. The city contains a public library, Calais Academy, Memorial Park and a customhouse. The river furnishes abundant water power, to which is due the great lumber trade of the city. There are also foundries, machine shops, granite quarries, and manufactures of shoes, calcined plaster, etc. Pierre du Guast, Sieur de Monts, who in 1605 founded at Port Royal the first French settlement in Canada, spent the winter of 1604-

05 on Big Island, within the present city limits. Calais was settled in 1779, incorporated as a town in 1809, and chartered as a city in 1850. It was nearly destroyed by fire in August, 1870. The government is administered under a charter of 1883 (revised 1901), which provides for a mayor, elected annually, and a city council, which elects heads of all departments. Pop., 1890, 7290; 1900, 7655; 1910, 6116. Consult Knowlton, *Annals of Calais* (Calais, 1875).

CAL'AÏS and **ZETES**, zé'téz. In Roman mythology, the two winged sons of Boreas. They took part in the Argonautic expedition, during which they rescued the blind King Phineus from the attacks of the Harpies. They were said to have been slain by Hercules on the island of Tenos, where their graves were shown. See ARGONAUTS; HARPY.

CAL'AMAN'DER WOOD. See EBONY.

CAL'AMARY (Neo-Lat. *calamarius*, from Lat. *calamus*, reed, pen). An Anglicized form of a European name for certain squids, given in allusion to the feather-penlike internal shell, often called a calamary. Pen-and-ink fish is another and similar name. See SQUID.

CALAMATTA, ká'lá-mát'tá, LUIGI (1802-69). An Italian line engraver. He was born in Civita Vecchia and studied in Rome under Marchetti and Ricciani. In 1822 he removed to Paris, where, as a follower of Ingres, he became one of the foremost engravers. In 1837 he was appointed professor at the Ecole des Beaux-Arts in Brussels, and developed an important activity as a teacher, numbering among his pupils Gustave Biot, Leopold Flameng, and Charles Blanc. In 1861 he was appointed instructor in the Brera Academy, Milan. Among his best-known plates are the death mask of Napoleon, after Dr. Antomarchi's cast taken at St. Helena, the portraits of Ingres and Paganini, after Ingres, Guizot after Delaroche, George Sand after an original drawing, "Francesca da Rimini" after Ary Scheffer, "La Gioconda" after Leonardo, and the "Madonna di Foligno" after Raphael. His engravings are characterized by correctness of drawing and finish. Consult Alvin, *Notice sur Luigi Calamatta* (Brussels, 1882).

CALAMBA, ká-lám'bá. A town of Luzon, Philippines, in the Province of Laguna. It lies on the south shore of Laguna de Bay, 27 miles southwest of Santa Cruz, and is connected by roads with several towns of the province. It has a telegraph station. Pop., 1903, 8058.

CALAMBUCO, ká'lám-bōō'kō (Sp., probably from Pers. *kalambak*, fragrant wood). A tree of uncertain relation found in the northern part of the island of Luzon and considered superior to teak or live oak for shipbuilding. The heart wood is dark and hard, like teak, and is proof against the destructive white ant of the Malay region. Warlike, mechanical, and agricultural tools and implements are made from it. The aloes wood is produced by *Aquilaria agallocha*, a large tree with heavy wood, shaded with green. It is aromatic and is burned as incense. This and *Aquilaria malaccensis* are said to yield the eagle wood. It is possible that calambuco is a product of the same or related species.

CALAME, ká'lám', ALEXANDRE (1810-64). A Swiss landscape painter. He was born in Vevey and studied in Geneva with Diday, whom he succeeded as head master of the art school. In 1837-38 he obtained gold medals in Paris. After traveling extensively for purposes of study he settled in Geneva, where he lived until

1863, and where a monument was dedicated to his memory, April 3, 1880. He was one of the best landscape painters of his day, and excelled in depicting Alpine scenery. His pictures are good in line and perspective but hard in color. Towards the end of his life popularity made his art commercial. Among his principal canvases are: "Bernese Oberland" (Leipzig Gallery); "Pass of Monte Cervino" (ib.); "Ruins of Pæstum" (ib.); "Wetterhorn" (Basel Museum); "Waterfall near Meiringen" (Bern Gallery); "A Storm on the Handeck" (ib.); "The Four Seasons" (Geneva Museum); "The Four Divisions of the Day" (Basel Museum); "Lake Lucerne" (Berlin Museum). He also produced numerous etchings and lithographs of Alpine subjects.

CALAMIANES, *kā'lā-myā'nās*, or **CULIÓN ISLANDS**. A group of islands in the western part of the Philippine Archipelago, in lat. 12° N. and long. 120° E., situated between the islands of Mindoro (from which it is separated by Mindoro Strait) and Palawan (Map: Philippine Islands, B 5). The islands are of volcanic origin, Busuanga, Culión, and Corón being the largest. They are all hilly, but yield tropical fruits in abundance, and small quantities of sugar cane, rice, and tobacco. Cattle raising and fishing are leading occupations. The climate is hot and unhealthy. The 98 islands comprising the group have a total land area of 677 square miles, and a population (1901) of about 17,000.

CAL'AMINE (Fr., from ML. *calamina*, corrupted from Lat. *cadmia*). A hydrated zinc silicate that crystallizes in hemimorphic forms of the orthorhombic system, whence the name "hemimorphite" occasionally applied to it. The name was originally applied to mineral zinc carbonate, but this is now known as *smithsonite*, while *calamine* is restricted exclusively to the silicate. It occurs massive or crystalline, often in mammillary, botryoidal, and fibrous forms, generally white, although sometimes with a bluish or greenish shade, and less frequently yellowish to brown. Calamine is found in Germany, Austria, in Derbyshire, England, and at various localities in New Jersey, Pennsylvania, and elsewhere in the United States. A fairly large tonnage is mined in southwest Missouri and sold to the smelters under the name of "silicate." When pure it contains 52 per cent of zinc and is therefore a valuable ore of that metal.

CAL'AMINT (Lat. *calaminthe*, Gk. *καλαμίνθη*, *kalaminthē*, from *καλός*, *kalos*, beautiful + *μίνθη*, *minthē*, mint), *Calamintha*. A genus of plants of the family Labiatae, nearly allied to balm (*Melissa*). The common calamint (*Calamintha officinalis*) is not infrequent in England. It has whorls of flowers on forked, many-flowered stalks, and crenate leaves with an agreeable aromatic odor. It is used to make herb tea and as a pectoral medicine. A number of species to which similar virtues are attributed are found in the United States. Two or three species of shrubby calamints are sometimes planted in borders of flower gardens. See **BALM**; **BASIL**.

CAL'AMIS (Gk. *Κάλαμος*, *Kalamis*). A Greek sculptor who flourished in the second quarter of the fifth century B.C., famous for the delicacy and grace of his statues. His works, which included statues of Apollo, Hermes, and Aphrodite, and part of a chariot group for Hiero, King of Syracuse, were widely scattered

throughout Greece, but nothing definite is known of his life. He is the representative artist of the transition period between the archaic art before the Persian wars and the art of Phidias. No work of his has come down to us, though attempts have been made to identify several pre-Phidian types with some of his celebrated works. Consult E. A. Gardner, *A Handbook of Greek Sculpture*, pp. 232-236 (London, 1911).

CALAMITES, *kāl'a-mī'tēz* (Gk. *καλαμίτης*, *kalamitēs*, reedlike, from *κάλαμος*, *kalamos*, reed). A genus of fossil plants, appearing first in the Devonian rocks, and rising through the intermediate formations to the Jurassic, where it is represented by a single species. They reach their maximum development in the coal measures, where a large number of species have been determined. The tall, straight stems rose from a swampy clay soil in profusion in the forests of sigillaria, and formed a striking and characteristic feature of the coal flora, though they supplied little material for the structure of coal. They are hollow-jointed cylinders, with longitudinal furrows, giving the fossil the appearance of *equiseta*. From this resemblance botanists have generally considered them as huge "horsetails." They belong to the *equiseta*, and the study of many specimens, both macroscopically and microscopically, has developed a number of subgenera. The modern "horsetail rush" represents, according to Seward, a degenerate type of the calamitean group. Hooker was unable to detect any traces of structure, in carefully prepared specimens, or the presence of those siliceous stomata which characterize *equiseta*, and which should have been preserved in the fossil state; but later investigators have been more successful in finding specimens from which internal structures could be determined. Fleming has shown that the furrows are markings on the interior cavity. The lower portion of a calamites trunk would show rings of scars where branches had fallen off, while higher up the younger branches contained whorls of slender leaves and long, slender cones. The root termination was conical, the joints increasing upward in size and length. The foliage of calamites has been described under different names. *Asterophyllites* includes jointed and fluted stems, with branches proceeding from the joints and bearing long, pointed leaves. *Annularia* has closely arranged leaves, while in *Sphenophyllum* the leaves were wedge-shaped. See **COAL**; **CARBONIFEROUS SYSTEM**; **Plate of CARNATIONS**.

CAL'AMUS. See **RATTAN**; **DRAGON'S BLOOD**.

CALAMUS (Lat., Gk. *κάλαμος*, *kalamos*, reed; cf. AS. *healm*, Eng. *haulm*). A word applied not only to the reed, but also to objects made from it, and especially to the ancient pen, which was commonly a split reed. Egypt furnished most of these reeds, though those from Cnidus were also highly esteemed. They were trimmed and split with a knife so that they looked like a quill pen, and were generally kept in a case. Imitations in bronze of the reed pens have been found. Reed pens are still used in the East, the Arabic word being *kalām*. The same name is also applied to the reed pipe or pastoral flute. See **SYRINX**.

CALAMUS. A name sometimes given to the sweet flag (*Acorus calamus*). See **ACORUS**.

CAL'AMY, EDMUND (1600-86). An English divine. He was born at Walbrook, February, 1600; studied at Pembroke Hall, Cambridge,

where he attached himself to the Calvinistic party; and afterward became domestic chaplain to the Bishop of Ely. In 1626 he was appointed lecturer at Bury St. Edmunds, but resigned his office in 1636, when the order to read the *Book of Sports* began to be enforced. In 1639 he was chosen minister of St. Mary, Aldermanbury, London. He now entered warmly into the controversies of the time and became noted as a leading man on the side of the Presbyterians. He had a principal share in the composition of *Smectymnius*, a work intended as a reply to Bishop Hall's *Episcopacie by Divine Right Asserted* (London, 1640), and one of the most able and popular polemics of the day. Like the mass of the Presbyterian clergy, he was monarchical and not republican in his political opinions. He disapproved, therefore, of the execution of Charles and the Protectorate of Cromwell, and did not hesitate to avow his attachment to the royal cause. He was one of the deputies appointed to meet Charles II in Holland and congratulate him on his restoration. His services were recognized by the offer of a bishopric, which he refused from conscientious scruples. He took part in the Savoy Conference (1661), but was ejected from his living by the Uniformity Act (1662); for venturing to preach in his church (Dec. 28, 1662) he was cast into prison, but Charles II secured his release. He died in London Oct. 29, 1666. Two of his sons were educated for a religious profession: the one, Rev. Dr. Benjamin Calamy, became a High Churchman, and wrote *A Discourse about a Scrupulous Conscience*; the other, Edmund Calamy, was ejected for nonconformity, and had a son, also named Edmund (1671-1732), who acquired reputation as the biographer of the ejected clergy. He was born in London, April 5, 1671; educated among the Dissenters and in Holland (1688-91); was pastor in London, 1692, and died there June 3, 1732. He was held in high regard, and his *Nonconformists' Memorial* (1778), as it is now called, a book which underwent important changes while in the author's hands, is the best source of knowledge respecting the 2000 ministers ejected from the Church of England by the Act of Conformity. Consult Palmer, *Abridgment of Nonconformists' Memorial* (London, 1802-03), and his autobiography, *Historical Account of my own Life* (London, 1830).

CALANCHIA, ká-lán'chà, FRAY ANTONIO DE LA (1584-1654). A Peruvian chronicler and religious; son of Capt. Francisco de la Calancha and María de Benavides. At the age of 14 he entered the Augustinian Order at Lima, where he made his studies for the doctorate in theology, which was conferred upon him by the University of Lima. Afterward he traveled extensively through Peru for the purpose of examining the ancient ruins of that country and of recording its traditions. He wrote accounts of all the things he had seen (including descriptions of monuments that have since disappeared), which he used when, as chronicler of the Augustines at Lima he prepared the important history (completed in 1633), which has been badly translated into French, under the pompous title *Histoire de l'église du Pérou aux antipodes et d'un grand progrès de l'église en la conversion de Gentils par la prédication des religieux ermites de l'ordre Saint-Augustin* (Toulouse, 1653). This version omits much that is important and interesting. The original work ap-

peared at Barcelona, 1639, under the title *Crónica moralizada del orden de San-Agustín en el Perú*. At Lima, 1653, he published his *Crónica de los santuarios de Nuestra Señora de Copacabana y del Prado*.

CAL/AND, or **KAL/AND** (KALEND BRÜDER, or FRATRES CALENDARI). A brotherhood of Roman Catholics devoted to charitable and religious works, dating from the thirteenth century, and of considerable extent in Germany, Switzerland, and France. Banquets being introduced at their meetings, abuses arose, and the associations gradually diminished, most being suppressed before the Reformation.

CALANDO, ká-lán'dô (It., slackening, from *calare*, to lower, diminish, decrease). A musical term which means diminishing by degrees in power (from forte to piano) as well as in rapidity, thus combining both the *decrecendo* or *diminuendo* (q.v.) and *ritardando* (q.v.) effects.

CALANDRELLI, ká-lán-drél'lé, ALEXANDER (1834-1903). A German sculptor. He was born in Berlin, where he studied at the Academy and later under Friedrich Drake and August Fischer. In 1871 he received his first important commission, a bronze relief for the east side of the Column of Victory with scenes from the Franco-German War. In 1874 he was appointed professor, in 1883 a member of the Berlin Academy, and in 1887 member of the Academic Senate. Among his principal works are a marble statue of Peter Cornelius (entrance to Old Museum, Berlin); terra-cotta reliefs for the Berlin City Hall; the equestrian statue of Frederick William IV (entrance to Berlin National Gallery); a colossal statue of William II for the Teltower District Hall, Berlin. Calandrelli was a follower of Rauch, but he never achieved any distinct artistic personality, and notwithstanding important commissions contributed little to the development of German sculpture.

CALANDRONE, ká-lán-drō'nâ (It.). A small variety of clarinet used by the Italian peasants, on which they play simple melodies and also sometimes accompany their national songs.

CAL/ANUS (Gk. *Kálavos*, *Kalanos*, from Skt. *kalyāna*, the fortunate). A Hindu philosopher, apparently a Brahman ascetic, whose real name, according to Plutarch, was Sphines. He was for some time in the camp of Alexander the Great at the invitation of the conqueror, but, having become seriously ill, he was burned alive at his own request at Persepolis.

CALAPAN, ká-lá-pán'. The capital of the island of Mindoro, Philippines, situated at the northeast extremity of the island, 85 miles east-southeast of Manila (Map: Philippine Islands, C 4). It has a harbor, courthouse, jail, and a fort. The inhabitants of the town, which is of little commercial importance, are engaged chiefly in fishing and weaving. Pop., 1903, 5554.

CALAPE, ká-lá'pá. A town of Bohol, Philippines, situated on the west coast, 19 miles north of Tagbilaran. Pop. 1903, 13,354.

CALAS, ká-lás' or ká-lá', JEAN (1698-1762). A Protestant merchant of Toulouse, whose judicial murder was the cause of an agitation in which Voltaire took the leading part. It resulted in the amelioration of the legal position of Protestants in France, and particularly discredited the administration of justice under the declining monarchy. Calas was accused of murdering his son because he wished to become a Roman Catholic. The son had probably com-

mitted suicide, and there was no evidence to support the accusation, which originated in a mob, and was fostered by Roman Catholic religious societies, the White Penitents, and the Franciscans, who treated the suicide with the honors due to a martyr. After a trial which lasted a whole winter, the Parliament of Toulouse, by a majority of eight to five, condemned Calas to death on the rack and confiscated the estate of the family. Calas's widow made Voltaire's acquaintance in Switzerland, and he actively took up her cause. After long labor he secured a rehearing of the case, and the Parliament of Paris declared Calas innocent and restored the estate to the family. The chief magistrate was degraded and fined. Consult Coquerel, *Jean Calas et sa famille* (Paris, 1858); *Causes célèbres*, vol. iv (1875); Kreiten, *Voltaire* (Freiburg, 1878); the studies of Voltaire by Morley (London, 1878) and Faguet (Paris, 1897); Raoul Allier, *Voltaire et Calas* (Paris, 1898); Masmontell, *La législation criminelle dans l'œuvre de Voltaire* (Paris, 1901); Tallentyre, *Life of Voltaire* (2 vols., London, 1903; New York, 1905).

CALASCIONE, ká'lá-shō'ná. A national instrument of southern Italy, a variety of guitar. It has two strings, tuned a fifth apart, and is played with a plectrum. The finger board is provided with frets.

CALASIAO, ká-lá'sé-á'ó. A town of Luzon, Philippines, in the Province of Pangasinan, 9 miles southeast of Lingayen, on the main highway to Manila. Pop., 1903, 16,539.

CALATAFIMI, ká-lá'tá-fē'mé. A city in the Province of Trapani, Sicily, 57 miles southwest of Palermo (Map: Italy, G 10). The town had its name, Kalat al-Fimi, from the Saracens, who captured it in 828. Near by are the ruins of the ancient Elymian town of Segesta, containing an unfinished temple of the fifth century. In 1860 Garibaldi won his first victory over the Neapolitan troops on a field 2 miles to the southwest, marked by a monument erected in 1892. The district about Calatafimi is well known for its cheeses. Pop. (commune), 1881, 10,000; 1901, 11,426; 1910, 10,486.

CALATAYUD, ká-lá'tá-yūd' (Ar. *kalat*, castle + *Ayub*, a Moorish king). A city of Aragón, Spain, situated on the Jalón, near its junction with the Jiloca, about 48 miles southwest of Saragossa (Map: Spain, E 2). It is built at the base of two rocky ridges, 1700 feet in height, out of the ruins of ancient Bilbilis, which lay about 2 miles to the east and was the birthplace of the poet Martial. The city is divided into a new and an old portion, the former having several fine streets and handsome squares, the latter composed of mean buildings and narrow, crooked streets. Calatayud has ruins of a noble Moorish castle, two collegiate churches, and a Dominican convent. Of the collegiate churches, Santo Sepulcro, built in 1141 and restored in 1613, long served as the chief church of the Spanish Knights Templars. The city manufactures silk, linen, and hempen fabrics, woollens, paper, leather, etc., and carries on a trade in agricultural produce. In former times it was celebrated also for its fine horses, its armorers, and its gold and iron. Pop., 1897, 10,900; 1900, 11,526; 1910, 11,594.

CALATRAVA, ká'lá-trá'vá. A military and religious order in Spain, instituted in 1158, in the reign of Sancho III of Castile. It received the town of Calatrava as a perpetual gift, on

condition that it should defend it against the Moors. The order was confirmed by Pope Alexander III in 1164 and very soon rendered effective service in the wars against the Mohammedans. While the Christian states in Spain were exhausting themselves by internal strife, the Order of Calatrava was the main bulwark against the Moors. In 1197 the latter captured Calatrava and the knights removed to Salvatierra. In 1212, however, they not only recovered Calatrava, but had an important share in the deadly blow which was struck at the power of the Almoravides. In 1213 Calatrava united with the Order of Avis. The power of the Knights of Calatrava was shown at the time they joined the orders of Alcántara and Santiago in exacting from Alfonso XI a guarantee of their liberties and customs. The later history of Calatrava is a series of civil wars between the grand masters, which became so troublesome to the government that Ferdinand and Isabella, in 1487-88, prohibited a new election and secured the grand mastership to the crown by a papal bull in 1493. Later Charles V made the order perpetual, with the King of Castile as head. In 1808 Calatrava became an order of merit. On March 13, 1872, the order was suppressed by the republican government, but was reorganized by Alfonso XII, June 13, 1874. Those who entered the order took the vows of poverty and obedience. At first marriage was forbidden, but Paul III in 1540 made this concession, and gradually the order lost most of its religious character. The original garb was black, but in 1396 Benedict XIII (antipope) allowed the knights to adopt the red cross. The present dress is a mantle of white, decorated with a red cross, cut out in the form of lilies.

CALATRAVA, JOSÉ MARÍA (1781-1846). A Spanish statesman, born at Mérida. He became known as an eminent orator of the Liberal party, and became a member of the Junta of Extremadura in 1808 and of the General Junta in 1810. Because of his radical views he was, upon the restoration of Ferdinand VII in 1814, arrested and condemned to eight years of penal servitude and exile at Melilla, but returned to Spain after the King's deposition. In 1821 he was elected to the Cortes, and in 1823 he became Minister of Justice, but when, through the intervention of the French, Ferdinand regained absolute power (1823), Calatrava was again banished. He lived in London until 1830, when he returned to Spain, became Minister of Foreign Affairs (1836), and was prominent in the parliamentary movement which resulted in the adoption of the more liberal constitution of 1837. When Queen Isabella assumed the government, in 1843, he was made a Senator. Because of his devotion to the cause of liberty and the personal suffering and sacrifice brought upon him thereby, we are justified in considering him one of the greatest figures in Spanish politics.

CALATRAVA LA VIEJA, lá vyá'há (Sp., Calatrava the Old, from Ar. *kalat*, castle + *Rabah*, a man's name), or OLD CALATRAVA. A ruined city of Spain, near Valdepeñas, situated on the Guadiana. In the Middle Ages it was a strongly fortified place, but nothing now remains save a single tower. Calatrava la Vieja was captured from the Moors by Alfonso VIII of Castile, and given to the Templars; unable to defend it, they returned the gift to Sancho III (1157). Raymond, Abbot of Fitero, and Diego Velasquez here instituted the Order of Calatrava

(q.v.) in 1158. In 1197 the Moors captured Calatrava la Vieja, but it was retaken in 1212. About 1217 the Knights of Calatrava la Vieja built a convent in the neighborhood, naming the place Calatrava la Nueva ('New Calatrava').

CALAVERAS (kāl'á-vā'rás) **GROVE.** The nearest to San Francisco of the California groves of big trees. The grove is 70 by 1100 yards in extent, and contains about 100 of the big trees, of which the "Keystone State," the highest now standing, has an altitude of 325 feet and a circumference of 45 feet. The "Mother of the Forest" is 61 feet, and the "Father of the Forest," not standing, is 112 feet in circumference. The grove is State property under a commissioner.

CALAVERAS RIVER. A small river of central California, and a tributary of the San Joaquin, which it joins just below Stockton (Map: California, C 2). It rises in the sierras of Calaveras County and pursues a southwesterly course.

CALAVERAS SKULL. A much-discussed human cranium reported to have been found in 1886 in auriferous gravels below lava beds near Angel, Calaveras Co., Cal. The specimen was described by J. D. Whitney, and is preserved in the Peabody Museum, Harvard University. Satisfactory accounts of the object and its associations have been published by Hrdlička in *Bulletin 33, Bureau of American Ethnology* (1907).

CALAVERITE, kál'á-vā'rít or -vērít. A gold-silver telluride found in pale bronze-yellow masses in California and Colorado. It is a rich ore of gold and silver.

CALBAYOG, kál-bā'yōg. A town of Samar, Philippines, situated on the west coast, 28 miles northwest of Catbalogan (Map: Philippine Islands, E 4). Pop., 1903, 15,895.

CALBUR'GA. See GULBAĞGA.

CALCAIRE GROSSIER, kál'kar' grō'syá' (Fr., coarse limestone). The middle Eocene stage of the Tertiary system of France. The strata of which it is composed are almost wholly limestones, and they outcrop in great force in the Paris basin. The strata are highly fossiliferous; the animal remains include mammalia, reptiles, and a large variety of lower-life forms. The Calcaire Grossier is represented in the English Tertiary by the Bracklesham beds; in the United States the Claiborne beds are equivalent to a portion of it.

CALCAR, kál'kar, HANS VON. See KALKAR, JOHANN STEPHANUS VON.

CALCAREOUS ROCKS (Lat. *calcarius*, pertaining to lime, from *calx*, limestone, lime). Rocks containing much lime, especially those in which the lime occurs in the form of carbonate (CaCO_3). Calcareous rocks form one of the main groups of sedimentary rocks and are very widely distributed, being found in all the larger stratigraphical divisions from the earliest to recent times. They are generally aqueous rocks and have been deposited in bodies of either marine or fresh water; the calcareous content is often supplied by the fossilized remains of the hard parts of animals that inhabited these waters. Thus many Paleozoic limestones are composed of shells, corals, and crinoidal fragments, while others, like chalk, consist of foraminifera and fragments of other minute organisms. When calcareous rocks become involved in mountain-making processes the carbonates assume a crystalline structure and they

are then known as crystalline limestones or marbles. Oölite is a calcareous rock composed of small, concretionary, egglike grains, resembling the roe of fish. The existence of the carbonate in rocks can be readily detected by the application of dilute nitric or muriatic acid, which causes effervescence through the liberation of carbonic acid. Quicklime is obtained from calcareous rocks by calcining them, i.e., by driving off the carbonic acid and other volatile matter by heat. Calcareous soils, often of great fertility, are produced from the disintegration of calcareous rocks. See ROCK; OÖLITE; SOIL; LIMESTONE; CALCAREOUS TUFF.

CALCAREOUS TUFFA (It. *tufa*, from Lat. *tufus*, tufa, tuff). A form of limestone deposited from solution in which it was held by an excess of carbon dioxide. Water absorbs this gas from the atmosphere and the soil, forming a weak acid which has a marked solvent effect upon calcareous materials, but with the escape of the gas on evaporation of the water they become insoluble and are precipitated as calcite or aragonite. Deposits of calcareous tufa usually have a loose, cellular, or spongy texture; they are formed on the beds of streams and shallow lakes or ponds, where they often encrust the mosses and other plants that grow in the waters. They are thus of superficial occurrence, but may extend over considerable areas, as in some of the old lake beds of the West. Another name for the material is travertine, which, however, may be better applied to the denser sorts with a fibrous or concentric structure, such as occurred near Tivoli, Italy, an old Roman town that lent its name (*Tibur*) to the material (*lapis Tiburtinus*). It is a rather porous stone for building purposes, but has been used to some extent as a structural material, as in the old temples at Pæstum, the Colosseum at Rome, etc. The stone acquires hardness and durable qualities with age. Calcareous tufa and travertine are white when free of admixture; colors like gray, red, and yellow are common and are brought about by metallic oxides or organic matter. The so-called Mexican onyx, a favorite ornamental stone, is a translucent travertine, beautifully tinted in shades of red and yellow by iron oxides. See LIMESTONE; ONYX.

CALCASIEU, kál'ká-shū. A river of southwest Louisiana, its headstream, Cypress Branch, rising in the parish of Natchitoches (Map: Louisiana, B 3). It pursues a course at first southeast, then southwest, and empties into Lake Calcasieu (nearly 20 miles long and three to six miles wide), which is connected with the Gulf of Mexico by the narrow Calcasieu Pass. By means of numerous branches, chiefly from the west, it drains a large area in southwest Louisiana, and is navigable for small boats for about 130 miles.

CAL'CEOLA'RIA (Neo-Lat., from Lat. *calceolus*, a little shoe, referring to the part of the corolla resembling a slipper). A genus of plants of the family Scrophulariaceæ. There are numerous species, natives of South America, chiefly of that part of the Andes which is more than 9000 feet above the sea, a few of them reaching almost to the upper limits of vegetation. Some are found in lower and warmer situations, and some in the southern extremity of the American continent, others occurring in New Zealand and Mexico. They are so abundant in some parts of Chile and Peru as to give a

peculiar aspect to the landscape. The calyx in this genus is four-parted; the corolla, two-lipped, the lower lip remarkably inflated, so as to form a bag; and the shape of the whole in some species considerably resembling that of a slipper. Some of the species are shrubby, some herbaceous, almost all the herbaceous species being perennial. Many of them have corymbs of numerous showy flowers. Yellow is the color which chiefly prevails in the flowers, and next to it purple; but the art of the gardener has succeeded in producing varieties and hybrids which exhibit many other rich and delicate tints. Calceolarias have been prominent in floriculture since about 1830, the curious appearance of the flowers combining with their beauty to render them attractive, and in no genus is the production of hybrids more easily or frequently effected. They are easily propagated by cuttings. Few plants require more liberal supplies of water. They are generally treated in the United States as half hardy or as greenhouse plants, and only the herbaceous forms are well known. Some of the species are used in South America for dyeing. The roots of *Calceolaria arachnoidea*, which is claimed to be one of the parents of many of the hybrids, are largely employed in Chile, under the name of *reibun*, for dyeing woolen cloths crimson.

CALCEUS. See SHOES.

CALCHAQUI, kál'chá-ké'. An important Indian people, now nearly extinct, whose language (no longer spoken), termed Catamarcan, Catamareñan, or Cacan, probably formed a distinct stock. The Calchaquian culture, the remains of which have been studied by Ambrosetti, Léjeal, Boman, Quiroga, etc., which was influenced, but not originated, by the Incas, who conquered part of this region about 1450, extended over a good deal of the territory now included in the Argentine provinces of Jujuy, Salta, Tucumán, and Catamarca, with some of La Rioja and San Juan, southward to the borders of Mendoza. The Calchaqui civilization was practically a "desert culture," interesting for comparison with the culture of the pueblos in the arid region of Arizona and New Mexico. It is characterized by village settlements (indicated by stone inclosures, foundations, etc.), mounds, cemeteries (with urn burial, etc.), metallurgic art (gold, copper, bronze), pottery, pictographs. Consult Ambrosetti, *I Calchaqui* (Rome, 1903), and other writings; also the article on the Calchaqui by A. F. Chamberlain, in the *American Anthropologist*, N. S., vol. xiv, pp. 503-507 (1912).

CALCHAS, kál'kās (Gk. Κάλχας, *Kalchas*). The famous prophet of the Greek army before Troy, gifted by Apollo with knowledge of the past and the future. Through his counsel Achilles, Neoptolemus, and Philoctetes were brought to the army. At Aulis he advised the sacrifice of Iphigenia to appease Artemis and foretold the length of the war. The common tradition made him go from Troy to Colophon, where, at the oracle of Apollo at Clarus, he met the prophet Mopsus in a contest of prophecy; having been defeated, he died of grief. His grave was shown in Apulia, in Italy; he had a temple and an oracle there.

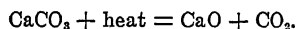
CALCHEDON. See CHALCEDON.

CALCIFEROUS (Lat. *calx*, lime + *ferre*, to bear). The term given to a subdivision of the Ordovician system. It is usually a sandy

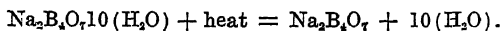
magnesian limestone, known as the calciferous sand rock. It is found in Canada and New York, extending southward through New Jersey and Pennsylvania. Its equivalent is also to be seen in the magnesian limestones of Iowa, Missouri, and Michigan. The formation is now known as the Beekmantown beds, from the locality near the village of that name in New York State. See ORDOVICIAN.

CALCIMINE (Lat. *calx*, limestone). See KALSOMINE.

CALCINING. The operation of heating an ore or mineral to such a temperature that some of its constituents, such as carbonic acid, or water either mechanically held or chemically combined, are driven off. It does not result in the addition of an element, as is the case with roasting. A familiar example is that of quicklime manufactured by calcining limestone as illustrated in the following equation:



The carbonic acid is driven off as a gas leaving the oxide of lime. Borax glass is the result of the elimination of water of crystallization by calcining:



Plaster of Paris and cements also are manufactured by calcining. The term "roasting" is frequently, but not properly, used interchangeably with calcining. Roasting is the oxidation of an ore or mineral by the addition of heat. See ROASTING; CEMENT; IRON AND STEEL.

CALCITE (Lat. *calx*, lime), **CALCAREOUS SPAR**, or **CALC SPAR**. An anhydrous calcium carbonate that crystallizes in the hexagonal system and differs from the mineral aragonite only in its form of crystallization. The massive and crystalline varieties are known as *limestone*, *marble*, and *chalk*, and are found almost universally and in all geological formations. As an accessory mineral, crystallized calcite is very widely distributed and quite universally present in a great variety of rocks. It is generally white or colorless, although pale shades of gray, red, green, blue, violet, and yellow are known, and, owing to the presence of impurities, even black and brown varieties are found. The crystallized varieties include the *dogtooth spar*, the acute scalenohedral crystals of which suggest its name; similarly, the name of *nailhead spar* has been suggested by the form of its short truncated crystals; *satin spar* is a fine fibrous variety with a silky lustre. *Iceland spar*, originally found in basalt rocks in Iceland, is a fine, colorless, transparent variety, with the property of double refraction; the finest specimens of this variety are used for making polarizing prisms which are quite generally used in certain optical instruments. Calcite is one of the vein-forming minerals.

CALCIUM (Neo-Lat., from Lat. *calx*, lime). A metallic element isolated by Sir Humphry Davy and, independently, by Berzelius and Pontin, in 1808. The name is derived from the Latin *calx*, lime, showing that calcium is the metal contained in lime. Calcium is not found native, but occurs extensively in combination with other elements in the forms of calcite (including limestone, marble, and chalk), aragonite, dolomite, selenite, gypsum, etc. It is also found in river and spring waters and in the bodies of plants and animals. Spectrum analysis has re-

vealed its presence in the sun. Davy obtained metallic calcium by the electrolysis of a moist paste made up of 3 parts of slaked lime and 1 part of oxide of mercury; the paste was laid on a foil of platinum, which formed the positive electrode, while metallic mercury, forming the negative electrode, was placed in a cavity in the paste itself. When the calcium amalgam so produced was distilled, it left a residue of moderately pure metallic calcium. At present, metallic calcium is made from calcium iodide, by the action of metallic sodium. According to a process improved by Moissan, 5 parts of anhydrous crystalline calcium iodide and 2 parts of metallic sodium are heated for an hour to a dull-red heat in a hermetically closed iron crucible. On cooling, the calcium crystallizes out of its solution in the sodium, and when lumps of the congealed mass are treated with absolute alcohol, the sodium dissolves, leaving behind calcium crystals that are 99 per cent pure.

Calcium (symbol, Ca; atomic weight, 40.07) is a lustrous, white, very ductile, and malleable metal of specific gravity 1.59. It melts at 780°C . (1436°F). The metal itself has no commercial application, although it is capable of forming a crystalline alloy with zinc. It is readily oxidized in moist air, even at ordinary temperatures, and when heated to redness it burns with a very bright yellow flame. Like sodium and potassium, it decomposes water with evolution of hydrogen. With the nonmetallic elements it is capable of forming compounds which are generally colorless and have an acrid taste. The most important of these compounds are described under special names. Suffice it to mention here, in the first place, the *hydride* of calcium, CaH_2 , a white, insoluble crystalline solid produced by the action of hydrogen upon metallic calcium at a dull-red heat; *dilute* sulphuric and nitric acids are decomposed by it with explosive violence. A *nitride* of calcium, Ca_3N_2 , is produced by heating calcium itself or its amalgam in a current of nitrogen; water decomposes the nitride, giving ammonia (q.v.). Finally, calcium combines directly with ammonia gas, giving *calcium ammonium*, $\text{Ca}(\text{NH}_2)_4$, a bronze-colored substance that catches fire on exposure to the air.

CALCIUM CARBIDE, CaC_2 . A compound of calcium and carbon. It was originally discovered in 1836 by Edmund Davy, who produced it simply as a laboratory curiosity. In 1862 Wöhler prepared it in Göttingen, and about the same time Berthelot, in Paris, obtained it, but only in small quantities. Borchers, in 1891, was the first to prepare the carbide by the electric method. In 1894 Thomas L. Willson, in Spray, N. C., found that, by heating a mixture of lime and carbon in an electrical furnace, calcium carbide and carbon monoxide were formed. This was the beginning of its commercial preparation. Almost simultaneously Henri Moissan, in Paris, announced his discovery of a similar method for its production. Its property of decomposing water with the formation of acetylene gas had already long been known, and the foregoing method just described made possible the economical production of acetylene gas for illuminating purposes, and accordingly that industry has since been largely developed, especially in the United States. The calcium carbide—or carbide, as it is called commercially—is now largely manufactured at Niagara Falls, N. Y., and Sault Ste. Marie, Mich.; and also at various places in Europe. The process consists essen-

tially in submitting a mixture of powdered lime and coke dust to the action of carbon electrodes in a furnace at a temperature of about 3300°C . The fused material is allowed to cool and harden, after which it is removed. Calcium carbide is a hard, brownish, crystalline compound with a metallic lustre and a specific gravity of 2.22, that is noninflammable, infusible, and insoluble in most acids and all alkalies; is absolutely unaffected by jars, concussions, or time, and is an inert and stable substance, except when brought into contact with water. Its principal use is for the manufacture of acetylene. Since its commercial introduction into the United States its manufacture has passed into the control of a single corporation. The history and methods of production of calcium carbide have been largely described in the various technical journals, and the *Acetylene Gas Journal*, published in Buffalo, N. Y., is devoted entirely to the exploitation of the new illuminant. Consult, also, De Perrodit, *Le carbure de calcium et l'acétylène* (Paris, 1897); Thompson, *Acetylene Gas: Its Nature, Properties, and Uses*; also *Calcium Carbide: Its Composition, Properties, and Method of Manufacture* (London, 1899). See ACETYLENE.

CALCIUM LIGHT. See DRUMMOND LIGHT.

CALC-SINTER. See CALCAREOUS TUTA.

CALCULATING MACHINES (from Lat. *calcularé*, to reckon, compute; see CALCULUS). Mechanical contrivances designed to facilitate computations, to relieve the calculator from the mental strain of his work, and to insure greater accuracy in results. Calculating machines exist in various forms, and are now made in such perfection that many business houses and banks regard them as a necessity, while many scientific computations would have been abandoned but for their help. An instrument which is used for the purpose of illustration or instruction in number work is called a reckoning apparatus, but one which automatically produces the results of number combinations involving the union of different orders is called a calculating machine.

The earliest-known instrument of calculation of any importance is the *abacus*. (See illus. under ABAQUS.) The Chinese lay claim to its invention. Its use by the Egyptians as early as 460 B.C. is definitely asserted by Herodotus. It was probably used by the Babylonians, and certainly by the Greeks and Romans, from whom it spread to all Europe. It has existed in various forms—the knotted strings, the sand board, the pebble tray, the counters, and the frame of beads. The last form is still in use, known as the Chinese *swan pan*, the Russian *stchoty*, or the Japanese *soroban*. The ordinary swan pan consists of a frame divided into two sections, holding several parallel rods, each containing several movable beads.

In the Chinese swan pan each bead on the bottom row in the right division represents one unit, and each on the bottom row in the left division represents five units. In the next higher row the value of each bead is 10 times as great, and so on.

The first improvement over the ancient abacus consisted in the use of counters, on a plan attributed, probably erroneously, to Boethius. Later these counters bore numbers and were attached to rods, disks, or cylinders, which could be moved so as to indicate the desired results. A notable example of this type is the set of rods invented by Napier and known as *virgulæ*; or,

popularly, as Napier's rods or bones. These consist of flat pieces of bone or ivory, divided into squares, which (on 10 of the rods) are subdivided by diagonals into triangles, except the squares at the upper ends of the rods, which spaces are numbered from 1 to 9.

To illustrate the process of multiplication, consider the product of 5978 by 937. Arrange the proper rods, as in the figure, so that the numbers at the top indicate the multiplicand, and on the left place the rod headed 1. In this

1	5	9	7	8	
2	1 0	1 8	1 4	1 6	
3	1 5	2 7	2 1	2 4	
4	2 0	3 6	2 8	3 2	
5	2 5	4 5	3 5	4 0	
6	3 0	5 4	4 2	4 8	
7	3 5	6 3	4 9	5 6	
8	4 0	7 2	5 6	6 4	
9	4 5	8 1	6 3	7 2	

ARRANGEMENT OF NAPIER'S RODS.

rod find the right-hand figure of the multiplier, which in this case is 7. Passing across this horizontal row, add obliquely the two rows of corresponding digits, writing the results in each case as the digits of the first partial product. For example, the first figure on the right is 6; this is written in the units place in the first partial product. Next add the 5 and 9 in the adjoining oblique row, which gives 4 in the tens place, with 1 to carry. This makes 8 in the hundreds column. Proceed in the same way with the other figures of the multiplier, and add the partial products as in ordinary multiplication.

41846
17934
53802
5601386

The chief point of improvement over the primitive abacus consists in supplying the instrument with moving scales, which enable the calculator to form number combinations without actually counting together the different addends. Kummer (1847) accomplished this by running parallel rods in grooves; Lagrous (1828), by concentric rings; Djakoff and Webb, by bands on rollers.

Modern calculating machines may be divided into two large classes, (1) adding machines and (2) multiplying and dividing machines. These terms are somewhat misleading, since an adding machine will subtract, multiply, and divide, but it cannot perform these additional operations with great speed; the multiplying and dividing

machine will also add and subtract, but so slowly that it will never be used commercially for such work. Hence the classification refers to the operation for which the machine is best suited and primarily constructed.

A typical modern adding machine is the comptometer. Numbers are added on this machine by depressing keys on the top similar to those of the typewriter. The keys in the column on the extreme right represent units; those in the next column to the left, tens; those in the column next to that, hundreds; and so forth. \$3.57 is recorded by depressing 3 in the hundreds column, 5 in the tens column, and 7 in the units column. To add \$1.25 to this, proceed in a similar manner, the sum automatically appearing on the dials at the front of the machine. This process can be continued with any number of items, the sum always appearing immediately at the front.

The mechanism of this and all other adding machines is based on the principle that our system of writing numbers has place value, 10 units making 1 ten, 10 tens making 1 hundred, and so forth. The units are placed around the circumference of a wheel, the tens in the same manner on a second wheel, the hundreds on a third wheel, and so forth. These wheels are operated by the keys above mentioned, which cause the wheels to turn one-tenth, two-tenths, three-tenths, . . . of a revolution depending on whether the key depressed is 1, 2, 3, . . . At the end of a complete revolution the unit wheel engages the tens wheel, causing it to move forward one-tenth of a revolution. In the same manner at the end of each complete revolution of the tens wheel the hundreds wheel moves forward one-tenth of a revolution; thus *carrying* is provided for. It is possible to subtract on the machine, but not by reversing the mechanism, as we might suppose. We must subtract by adding—a process known as complementary subtraction. Instead of subtracting the number we add its complement. Mechanical aids are provided on the machine to obtain the complement. Multiplication can also be performed by considering it as continued addition. To multiply 27 by 43 we strike 27 three times and 270 four times, the result being the product.

Machines of the above type give all results on the dials at the front; but they give results only, and in no way show finally the items which made up the result. The above machine has no printing attachment by which it lists the items, as well as their total, on a ribbon of paper. Such a machine as the comptometer is therefore called a *nonlisting* machine. There is another type of adding machine which prints the items as well as the totals on a roll of paper; such a machine is called a *listing* machine. A typical machine of this type is the Burroughs adding machine. On this machine the arrangement of keys and the manner of operating them are the same as on the comptometer. As fast as each number item is recorded on the machine a lever is pulled at the right, or, if the machine is operated by electricity, a button is pressed. When the operation is finished, each of the items, together with their total, will appear in typewriting on a slip of paper. These machines are provided in different models, some printing on a narrow roll of paper and others on a wide sheet, the latter adapting itself peculiarly to the purposes of mechanical book-keeping. Machines using the narrow band of

paper are in use in practically every bank in the United States; those using the wide sheet of paper are in use in many of the larger business houses.

The usefulness of machines of the type just described has recently been greatly extended by combining the regular typewriter with the adding machine, thus making possible genuine mechanical bookkeeping. One of the representative machines of this kind is the Elliott-Fisher, which is extensively used in large business houses for making up monthly statements and accounts.

The Remington and Underwood Typewriter Companies offer a similar kind of machine which combines adding mechanism with the usual type-writing feature. All of these machines offer wide possibilities in the simplifying of modern accounting methods. Efforts are being made each day to extend the usefulness of this phase of work.

Cash Registers are a form of adding machine in general use in retail stores, whose chief functions are to make a record of money received from every sale of merchandise, as the money is placed in the cash drawer, and to add automatically this sum to the total previously placed in the drawer; it also indicates to the customers the record which has been made. The more complex cash registers have been further developed so that it is possible to include an automatic record of other transactions which take place in a retail store, including credit sales and the separate sales of individual clerks or of particular lines of goods, so that they may be referred to at the close of the day's business.

The first practical cash register was invented by James Ritty, of Dayton, Ohio, who secured his patent in 1879. In this first register the record was made on adding wheels and displayed by hands on a dial, but in later inventions the record is sometimes made by puncturing printed rolls of paper and is shown by indicators which rise and fall as the mechanism is operated, a number equal to the amount of the purchase rising as the cash paid is deposited in the drawer, the same operation causing the number which records the previous purchase to fall. In the "detail adders," manufactured by the National Cash Register Company, the mechanism is operated by pressing the proper registering key. A single pressure of the finger unlocks and throws open the cash drawer, rings a bell, drops the indicator showing the last transaction, raises an indicator showing the amount of the new transaction, and at the same time records it on the adding wheels inside the register. Each registering key is connected with a corresponding adding wheel inside the register, which shows the total amount of registrations made on that key. For example, if the "5-cent" key be pressed five times its corresponding adding wheel shows a total of 25 cents. Thus the total amount of the day's sales can be ascertained at any time by adding together the total amounts shown by the adding wheels. These registers can be arranged to keep separate record of "charge," "received on account," and "paid out" transactions, or to show separately the receipts from different classes of goods. A drawer cannot be opened without making both an indication to the customer and an inside record under lock and key.

The **Electric Tabulating Machine**, such as the one devised by Hollerith for recording and

summarizing the United States census returns, may be classed as an adding machine. This apparatus is in three parts. The first operation is to punch holes in a card, corresponding to the facts to be recorded for each individual, the punches being operated from a keyboard of 240 characters. After the cards are punched they are fed into a machine, which, by means of the holes and certain electric devices, adds one to the total record for the fact indicated by each hole, such as sex, color, or age. Next the cards are placed in sorting boxes, in order to secure a combination of facts, such as the number of black persons who are married, and by means of electric connections which are acted upon only by cards having holes corresponding to the facts to be tabulated, the record is made.

Multiplying and Dividing Machines may be separated into two classes, depending upon the principle by which the mechanism obtains results, i.e., whether the product is obtained as the result of repeated additions or as a direct multiplication. Machines of the first group will be considered first. Leibnitz conceived this type of machine in 1671 and made two models, but they were so mechanically imperfect that they were never practical. It is not until 1820 that we find a practical type of multiplying machine which worked with surety; Thomas de Colmar deserves the credit for producing it. The essential part of the mechanism of this machine is a drum with nine teeth of unequal length, which was invented by Leibnitz. To multiply 267 by 4 on such a machine, the operator sets the number 267 by sliding three knobs to their proper position; he then turns a small handle four times, and the product immediately appears on a special set of dials. Each turning of the handle adds the number to itself, thus performing continued addition. To multiply 267 by 54, the operator begins as described above to multiply by 4, then the carriage of the machine is shifted one space and the handle is turned five times, after which the product appears on the special set of dials. The distinct advantage of this type of machine lies in the fact that, besides the product, both of the factors can be left on the machine as a check upon the work. This type of machine is sometimes known as the Thomas Arithmometer. Burckhardt in Germany and Tate in England produced slight improvements on the Thomas machine. A modern machine of this type is the Saxonia Reckoning Machine. Division is performed on this machine by reversing the mechanism, making it a process of continued subtraction. Another form of multiplying machine which works on the principle of continued addition is the Brunsviga. In principle this machine differs slightly from that of Leibnitz in that it substitutes for the Leibnitz drum a single wheel on whose circumference one can cause to be projected 1, 2, 3, . . . to 9 teeth. The Brunsviga type of machine was originally invented by a Russian, Odhner.

The machines just described can perform multiplication only by repeated addition, and division only by repeated subtraction. We should do the same thing with pencil if it were not for the fact that we have learned the multiplication table. Is it possible to have a machine which will apply the multiplication table and thus perform multiplication directly? This question was answered in the affirmative by a French inventor, M. Bollée, who constructed a

practical machine of this kind and first presented it to the public in 1889. A more modern machine of this type commonly used in America is called the Millionaire, invented in 1892 by Otto Steiger and manufactured in Switzerland. The vital part of this machine is a mechanical multiplication table made up of a series of teeth of unequal length, all of which project perpendicularly from a common base. On this machine to multiply, say, 193 by 96, the operator sets 193 by sliding small knobs, turns a pointer to 9, and then presses an electric button. The pointer is then turned to 6, and the button pressed again, which completes the entire operation of multiplying by 96, the product appearing at once on a special row of dials. On the machines multiplying by continued addition it would have been necessary, in performing this multiplication, to turn the handle six times and then nine times, while on the Millionaire a single turn serves for each digit of the multiplier. Division is performed by reversing the mechanism by a small lever.

Multiplying machines of the types described above are used extensively in the actuarial departments of large insurance companies and in scientific laboratories, especially those of astronomers. The machine is also extensively used in large business houses for cost accounting, for making out invoices, and for general statistical work. It is also used in the calculations of engineering.

In small multiplications and divisions where approximate results will serve one frequently finds the *slide rule* used. This is an inexpensive type of multiplying machine and is more generally employed than any other class of calculating instruments, particularly by engineers and statisticians. In its simplest form it consists of two rules, arranged to slide on each other, and so divided into scales that by sliding the rules backward or forward until a selected number on one scale is made to coincide with a selected number on the other, the desired result is read off directly on a third scale. By means of a duplex slide rule, where the rule may be set for four factors instead of two, more complicated problems may be solved. *Revolving slide rules* are employed to increase the virtual length of the scales and the number of decimal places to which results may be read. In the Thacher calculating instrument, a cylinder 4 inches in diameter and 18 inches long revolves within a framework of triangular bars, each of which contains a scale on two sides. The scales contain 33,000 divisions and 17,000 engraved figures, executed on a dividing machine made expressly for the purpose. *Fuller's spiral slide rule* consists of a wooden cylinder containing a spiral scale 42 feet long.

Circular slide rules, resembling watches, are also made. The slide-rule principle is also employed in instruments used to work out specific problems, such as the flow of water in pipes, or the strength of beams. Such *computers* may be either like the ordinary slide rule, with scales in terms of the factors involved, or, as in the various Cox computers, there may be a foundation plate, revolving disk, revolving segment, and index or pointer, with proper scales. The various slide rules proper all depend on the mechanical use of logarithms, and the scales are graduated on a logarithmic basis. By referring to the article LOGARITHMS, the operation of a simple slide rule will readily be understood, as the various graduations correspond to the loga-

rithmic functions, and the appropriate length of each is determined from a table of logarithms. The figures inscribed on the scales, however, are those of the numbers corresponding to the logarithms. For example, to multiply 2 by 2, the number 2 on the scale is brought opposite the number 2 on the second scale, and, as a result, the zero of the latter is distant from the zero of the first by an amount equivalent to the sum of the two logarithmic graduations. The number corresponding to the point at which the zero or indicator stands is, of course, the product, which in this case is 4. The complexity of the problems which may be solved with the aid of the slide rule varies with the different rules; but, in general, it may be said that all problems involving multiplication and division may be solved by any of them, including powers, roots, and proportions, simply by setting the rule and reading off the indicated result. By providing scales with trigonometrical instead of arithmetical functions, the uses of the slide rule may be increased greatly, and often the two classes are engraved on reverse sides of the smaller slide rules. The rule is particularly valuable where the same operation is to be repeated many times, as in computing percentages, or where many long and wearisome calculations are to be made.

The small 10-inch slide rule gives results correct to two or three significant figures, while the 20-inch slide rule gives results generally correct to three figures. The Thacher or Fuller slide rules give still greater precision. More and more there is a tendency to introduce the slide rule in business practice, especially in cost accounting. By properly combining adding machines, adding typewriters, and multiplying machines many large business houses, such as department stores, are able to do all their bookkeeping mechanically. The next few years promise a wonderful development in this direction.

For descriptions of calculating machines, consult: Mehmke, *Numerisches Rechnen*, in *Encyklopädie der mathematischen Wissenschaften*, vol. i (Leipzig, 1901), containing numerous figures; Unger, "Einige Additionsmaschinen," *Abhandlungen zur Geschichte der Mathematik*, vol. ix (Leipzig, 1899); Shaw, "Theory of Continuous Calculating Machines" in *Phil. Transactions of Royal Society*, vol. clxxvi (London, 1885); D'Ocagne, *Le calcul simplifié* (Paris, 1905); Thompson, *Bookkeeping by Machinery* (New York, 1906); Seward, "Mechanical Aids in Factory-Office Economy," in *Engineering Magazine*, for July, 1904; Beach, *Tools of Business* (Detroit, 1905); Jacob, *Le calcul mécanique* (Paris, 1911); and especially the literature issued by the various companies selling modern calculating machines. On the abacus, consult Smith and Mikami, *History of Japanese Mathematics* (Chicago, 1914).

CALCULATORS (Lat. *calculator*, computer; see CALCULUS), REMARKABLE. Arithmetical prodigies, often spoken of as "lightning calculators," having an unusual capacity for combining numbers. The wonderful feats of these prodigies have been pronounced genuine by competent judges, although their psychological peculiarities have not been fully explained. Two peculiarities, however, seem characteristic of most of the known cases: an extraordinary memory for numerical combinations, and unusual methods of grouping numbers. That their ability is not entirely the result of special training is attested by the early age at which the power is mani-

fed. Thus, at the age of six, T. H. Safford computed mentally the number (617,760) of barleycorns in 1040 rods, and could extract the cube roots of numbers of 9 and 10 figures. Buxton solved the problem, to find the product of doubling a farthing 139 times, the result, expressed in pounds, being a number of 142 figures. Zerah Colburn, at nine years of age, gave at sight the factors of 294,967,297, and in 20 seconds found mentally the number of hours in 1811 years. Raising 991 to the fifth power in 13 operations, and giving the product of any pair of two-figure numbers in $1\frac{1}{2}$ seconds, are feats accomplished by Arthur Griffith, who also memorized the squares of all numbers up to 130 and the cubes up to 100. Other noted prodigies are Annich, Bidder, Vinckler, Pughiesi, Mondeux, Magimelle, and Inaudi. Consult Lahy, "Une calculatrice-prodige; étude expérimentale d'un cas de développement exceptionnel de la mémoire des chiffres," in *Archives de psychologie*, vol. xiii, pp. 209-243 (Geneva, 1913).

CALCULUS (Lat., a small stone, or pebble, which was used in reckoning, or calculations, by the Romans). A term applied in mathematics to any method of treating problems by means of a system of algebraic notation. Thus, the Calculus of Forms (see FORMS) is a symbolic treatment of the properties of invariants; Imaginary Calculus is the method of calculating by the use of the imaginary unit (see COMPLEX NUMBER), and the Calculus of Quaternions (see QUATERNIONS) is the method of treating certain problems with the aid of the quaternion symbolism. Usually, however, the term is employed to designate the Differential and Integral Calculus, a branch of mathematical science affording, by one general method, a solution for many of the most difficult problems of pure and applied mathematics.

The Differential and Integral Calculus. This is one of the most useful branches of mathematics. While elementary algebra and geometry deal with quantities whose value is fixed, the calculus investigates quantities whose value is continually changing. Considering that all nature in all its aspects varies continually, the importance of a mathematical method of dealing with variables is evident; and it is easy to see why science had made so little progress before the invention of the calculus, and why progress has been so rapid since.

Three simple examples may serve to show the kind of problems usually attacked by the calculus, and the manner in which it solves them. The first two of these examples can also, on account of their simplicity, be solved by means of elementary algebra, without resorting to the calculus. Nevertheless, they are typical calculus problems, and furnish as good examples of the calculus method as would be furnished by similar but much more complicated problems lying really beyond the power of elementary mathematics.

Problem I. Suppose the sum of two adjoining sides of a rectangle known. What must be the length of each side so that the rectangle may have the greatest possible area?

Problem II. A person in a boat 3 miles from the nearest point on a straight shore wishes to reach a place 5 miles away from that point. He can row 4 miles an hour and walk 5 miles an hour. Where should he land in order to reach his point in minimum time?

Problem III. To determine the work per-

formed when a gas is compressed at constant temperature is one of the fundamental problems of theoretical engineering. Work is generally defined as the force required to move a body, multiplied by the distance traversed. In the case of a gas compressed in a cylindrical vessel, the body moved is the piston. If at the beginning of the experiment the pressure exercised on the piston is, say, p pounds per square inch



of surface, and the area of the piston is a ; then $p \times a$ is evidently the force acting on the piston. This force, however, multiplied by the distance traversed by the piston during compression will not by any means give the work performed. For during compression the force will, of course, have to be continually increased; in other words, it will not retain its original value ap fixed, but will be a variable. In this case algebra and geometry fail to give a method of direct computation and the calculus has to be resorted to.

In order to understand how the calculus deals with problems of this nature, it is necessary to grasp clearly some fundamental ideas, which usually appear somewhat difficult to the beginner in calculus, just as the idea of any fixed number being represented by the letters a , b , c , appears difficult to the child first taking up the study of elementary algebra.

Fundamental Ideas: Function, Differential, Differential Coefficient, Limit.—Variables are represented in calculus by the Latin letters x , y , etc., or by the Greek letters ξ , ζ , etc., just as unknown quantities are represented in algebra. If the value of one variable y continually depends on that of another variable x the first variable is said to be a *function* of the second, and the fact is denoted by writing: $y = f(x)$. Thus, the variable area y of a square is said to be a function of the variable length x of its side, and in this case the expression $y = f(x)$ stands for the equation $y = x^2$. In investigating the functions and their variables, the calculus catches them at a given moment for the purpose of determining the relative rate of their variation at that moment. Consider the motion of a ball thrown up in the air. Its velocity changes from instant to instant. We might get a rough idea of its motion by measuring the distance traversed during the first second, during the second second, during the third second, etc. But our results would be far from precise; for, however small an interval of time a second is, the velocity of our ball, changing continually, must be different at the end of that interval from what it is at its beginning. Our results would be even rougher if instead of the second we employed as a unit of time the minute. To render the results mathematically precise, we should have to take for our unit not a finite, but an infinitely small interval of time, an instant. The distance traversed during such an interval would be called the *differential* of distance and would be denoted in calculus by the symbol dl , if l stand for distance. Similarly, our infinitely small interval of time would be called the *differential* of time and would be denoted by the symbol dt , if t stand for time. But as this idea of what a differential is is somewhat vague, owing to the difficulty of actually conceiving

something that is "infinitely small," the following considerations may be resorted to. Studying the motion of a ball thrown up in the air, we consider infinitely small intervals of time dt merely in order to be able to think of the motion as uniform; for within any finite interval the motion is variable. But if at a given instant the motion should actually become uniform and continue so, we might think of our differential dt as representing any finite length of time, be it 5 minutes, or 10 minutes, or 500 minutes. For when a body moves with perfectly uniform speed, that speed may be readily determined by ascertaining the distance traversed during any interval of time whatever; the result is the same whether we divide the distance traversed in 5 minutes by 5, or that traversed in 10 minutes by 10. We may, accordingly, define the differential of distance dl as the distance that would be traversed by the ball in an arbitrary, finite interval of time, dt , beginning at a given instant, if at that instant the motion became uniform. In this manner we may avoid thinking of infinitely small quantities. The velocity would then be $dl \div dt$, no matter how great or small dt is supposed to be. The ratio $\frac{dl}{dt}$ is called the *differential coefficient* of l with respect to t —the distance l being of course "a function" of the time t . This ratio represents a *limit*. For, considering again the ball thrown up in the air, the error introduced by choosing a finite instead of an infinitesimal interval of time is the less the smaller an interval is chosen, and finally the true velocity $\frac{dl}{dt}$ is approached as a limit, when the interval of time becomes infinitely small. All this is concisely represented by a few symbols, as follows:

$$\lim_{\Delta t \rightarrow 0} \left(\frac{\Delta l}{\Delta t} \right) = \frac{dl}{dt}.$$

In this expression Δt stands for some finite interval ("increment") of time, and Δl for the distance actually traversed during that interval. And the expression tells that when Δt approaches zero ($\Delta t \rightarrow 0$), i.e., when it becomes infinitely small, the ratio $\frac{\Delta l}{\Delta t}$ approaches as a limit the value $\frac{dl}{dt}$. It need hardly be remarked that while dl and dt are themselves infinitesimal quantities, their ratio may have any finite value, large or small.

Maxima and Minima.—Since $\frac{dl}{dt}$ represents the velocity of the ball at any moment of the flight, it is evidently itself a variable quality. For when, say, a rubber ball is thrown up in the air, the velocity of its motion becomes smaller and smaller until the highest point in its flight is reached; at that point the ball *pauses* for an instant and then begins to descend with increasing speed until it reaches the ground. At the instant the ball is at the highest point the velocity is therefore zero; i.e., $\frac{dl}{dt} = 0$. But as the point reached by the ball is the *highest* it may be said that when the function l has its maximum (or minimum) value, its differential coefficient with respect to its variable (i.e., $\frac{dl}{dt}$) is zero. This must be carefully remembered.

Bearing in mind the ideas explained in the preceding paragraphs, the problems cited at the beginning of the article may now be analyzed without any difficulty.

I. Solution of the First Problem.—In the problem of the maximum rectangle, let a be the known sum of two adjacent sides, let x be one of the sides, and let y be the area of the rectangle. Then

$$y = x(a - x), \text{ or } y = ax - x^2.$$

Seizing the rectangle at some point in its variation, let us lengthen the side x by some finite amount, Δx , and suppose that this causes the area to increase by a finite amount, Δy . Our equation then becomes

$$y + \Delta y = a(x + \Delta x) - (x + \Delta x)^2 = ax + a\Delta x - x^2 - 2x\Delta x - (\Delta x)^2.$$

Subtracting the original equation, $y = ax - x^2$, we get

$$\Delta y = a\Delta x - 2x\Delta x - (\Delta x)^2,$$

and, dividing throughout by Δx ,

$$\frac{\Delta y}{\Delta x} = a - 2x - \Delta x.$$

Making Δx smaller and smaller without limit, it will ultimately approach zero. Then $a - 2x - \Delta x$ will become simply $a - 2x$, while the ratio $\frac{\Delta y}{\Delta x}$ will approach its limit $\frac{dy}{dx}$ and hence we shall have

$$\frac{dy}{dx} = a - 2x.$$

Now, it was shown above that, at the instant a function passes through its maximum value, its differential coefficient is zero. Hence, when the area of our rectangle is the greatest possible, $\frac{dy}{dx} = 0$, and therefore, $a - 2x = 0$, or

$$x = \frac{1}{2}a.$$

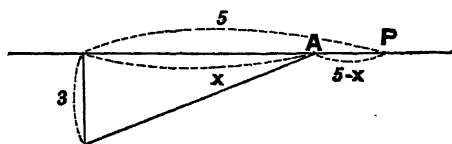
But this tells us that each side must be one-half of the known sum, i.e., that the two adjoining sides must be made equal in order that the rectangle may have its maximum area.

The process just employed in solving the problem may be described as "differentiating with the aid of the theory of limits." Indeed, we started with the law that the area of a rectangle equals the product of two adjoining sides, a law expressed in our case by the equation $y = x(a - x)$. We then ascertained the ratio of the finite increment of area to an actual finite increment of the variable side x . Next we ascertained the limiting value of that ratio corresponding to an infinitely small increase of the side. This gave the value of the differential coefficient $\frac{dy}{dx}$ of our function as $a - 2x$. And as it had been shown before that the differential coefficient is zero at the point where a function has its maximum value, we wrote $a - 2x = 0$, which gave the value of the side x for that point.

By analogous processes of reasoning we may "differentiate" any function whatever, and thus determine the form of its differential coefficient. In practical work, however, it is not necessary to go through the whole process every time a function is differentiated, and the differential coefficient of a function is usually obtained directly by the use of a few general formulas, the demonstrations of which are given in all textbooks of

calculus. In solving our other problems we will make direct use of two such formulas.

II. *Solution of the Second Problem.*—In the problem of the person in a boat, call A the point



where he must land in order to reach his point P in the least time. An inspection of the accompanying figure shows that the distance of the boat from the point A is $\sqrt{3^2 + x^2}$ (hypotenuse of the right-angle triangle). To row this distance at the rate of 4 miles an hour requires $\frac{1}{4}\sqrt{3^2 + x^2}$ hours, or, as it may be written, $\frac{1}{4}(9 + x^2)^{\frac{1}{2}}$ hours. The distance of the landing point from the point of destination is denoted by $5 - x$. To walk this distance at the rate of 5 miles an hour requires $\frac{1}{5}(5 - x)$ hours. The total time (call it y) required to

reach the point is therefore $y = \frac{(9 + x^2)^{\frac{1}{2}}}{4} + \frac{5 - x}{5}$. The question is, what must be the

numerical value of x in order that this expression for time may have the smallest possible value? As in Example I, the question may be answered by ascertaining the form of the differential coefficient $\frac{dy}{dx}$ and making it equal zero, so that it may correspond to the minimum magnitude of y . The result is as follows:

$$\frac{dy}{dx} = \frac{x}{4\sqrt{9 + x^2}} - \frac{1}{5}.$$

When y is a minimum, $\frac{dy}{dx} = 0$, and therefore,

$$\frac{x}{4\sqrt{9 + x^2}} - \frac{1}{5} = 0,$$

whence $x = 4$. To reach the point of destination in minimum time, the person must therefore land 1 mile ($5 - 4 = 1$) from that point.

Differentiation and Integration.—It may be seen from the examples thus far discussed that the problem of the differential calculus is to obtain for every function considered the differential coefficient $\frac{dy}{dx}$, i.e., the rate of change of

the function y with respect to its variable x . The process may also be described as follows: To differentiate a given magnitude y , expressed in terms of its variable x , is to obtain the value of the infinitesimal element dy in terms of the infinitesimal element dx of the variable x . The converse process, called integration, may be described as follows: To integrate means to obtain the function itself, when its rate of change with respect to the variable is given, i.e., to find y in terms of x when $\frac{dy}{dx}$ is given. The problem of

the integral calculus may also be stated in the following terms: To integrate is to find the magnitude y in terms of the variable x , when dy (an infinitesimal element of y) is given in terms of x and dx (an infinitesimal element of x). In the latter definition integration appears as a process of summation, the addends being an

infinite number of infinitely small elements. The symbol of integration is \int (the mediæval S , standing for *summa*). Thus, the symbol $\int dx$ indicates that it is required to integrate the differential of x .

The Constant of Integration.—Since a fixed (constant) quantity neither increases nor decreases, its differential is nothing at all. If, therefore, c denote any constant whatever, we may write $dc = 0$. For this reason the differential of $x + c$ is simply dx , the same as the differential of x . Comparing $x + c$ and x , we see that x is one of an infinite number of possible values of $x + c$; the latter, namely, equals x in the particular case where $c = 0$. When it is required to find in general the integral of dx , we therefore write not x , but $x + c$. So that $\int dx = x + c$. The constant c is then called the "constant of integration," and may either have a finite fixed value, or else may equal zero.

III. *Solution of the Third Problem.*—The last of the cited problems may now be attacked, viz., to determine the work performed when a gas is compressed at constant temperature. The difficulty of this problem is in the fact that during compression the force is variable, i.e., it must be continually increased. If we were to suppose



the force constant, we should, in calculating the work, commit the greater an error, the greater the amount of compression. But suppose the piston to be moved inward only an infinitely small distance. If we then calculate the work required, on the hypothesis that within that distance the pressure remains constant, we commit only an infinitely small error. In other words, our result is infinitely near the truth. Let dl therefore stand for an infinitely small distance traversed by the piston, let the area of the piston be a , and let the variable pressure be denoted by p . The work is then $p a dl$. But as $a dl$ is the volume of the infinitely small cylinder traversed by the piston, it may be denoted by dv and regarded as an infinitesimal element of our cylindrical vessel. The work is thus $p dv$.

To determine now the finite amount of work required to compress the gas from some initial volume, v_1 , to some final volume, v_2 , we will first answer the question: How much work would be required in compressing a given amount of gas from any volume v to unit volume? This is accomplished by "integrating" $p dv$, i.e., by performing the operation denoted by the symbol $\int p dv$; and our result will be infinitely near the truth, because the error involved in assuming that the pressure p remains constant through the infinitesimal compression dv is infinitely small.

To integrate $p dv$ we must remember that at constant temperature the product of pressure and volume of a gas is constant: $p v = k$, whence

$p = \frac{k}{v}$. Substituting this in $\int p dv$, we have $\int \frac{k dv}{v}$. Now $\frac{k dv}{v}$ might be shown, by the method of limits repeatedly employed in this article, to be the exact differential of either

$k \log v$, or $k \log v + c$, c being any constant. We may therefore write, conversely,

$$\int \frac{k dv}{v} = k \log v + c,$$

the constant of integration c being retained so as to give the solution its more general form.

The integral calculus has thus performed for us a wonderful task. Figuratively speaking, it employed a cylinder of volume v filled with gas and compressed it, an infinitesimal amount at a time, until unit volume was attained; it then summed up the infinitesimal amounts of work performed, and it has told us that the total amount of work done is $k \log v + c$. The result is general, since v may have any finite value whatever. But to obtain a desired particular result, all we have to do is to substitute for v some numerical value. Thus, for $v = 1$ we have $\log v = 0$, and the work of compression to this stage is the constant c . Further, the work performed in compressing the gas from some particular volume v_1 to some particular volume v_2 evidently equals the difference between the work required to reduce the gas from volume v_1 to unit volume, and that required to reduce the gas from volume v_2 to unit volume. The required work, W , between the limits v_1 and v_2 is, therefore,

$$\begin{aligned} W &= k \log v_1 + c - k \log v_2 - c \\ &= k \log v_1 - k \log v_2. \end{aligned}$$

The limits being defined, this "integral" is called a *Definite Integral*, and the operation is usually denoted as follows:

$$\int_{v_2}^{v_1} \frac{k dv}{v} = k \log v_1 - k \log v_2 = k \log \frac{v_1}{v_2}$$

The constant k , coming from the law $pv = k$, depends on the amount of gas employed and on the temperature at which the compression is carried out. It may, of course, be found by actually measuring the pressure and volume of the given amount of gas at the given temperature, and multiplying the pressure by the volume. By substituting in the above expression this value of k , as well as the numerical values of the initial volume v_1 and the final volume v_2 , involved in an actual compression, we shall finally obtain the work which the problem required to calculate, and this is actually the way in which engineers determine that important quantity.

Another Way of Stating and Solving the Third Problem.—The relation $pv = k$ between the pres-

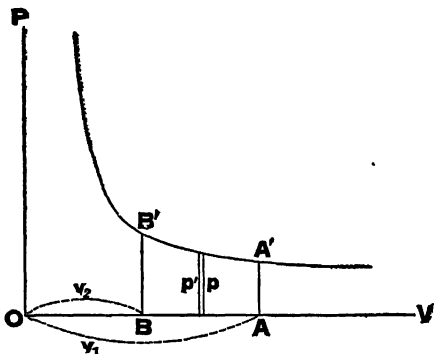
sure and volume of a gas whose temperature is kept constant (i.e., the law of Boyle and Mariotte) may be represented geometrically by a curve called an equilateral hyperbola, every point of the curve corresponding to a definite pressure and volume. (See ASYMPTOTE.) Further, it is shown in textbooks of natural philosophy that the work performed in compressing the gas from an initial volume represented by the line OA (see figure) to a final volume, OB , is represented by the area $AA'B'B$. The problem of determining the work may therefore be viewed as requiring to determine the area inclosed by the hyperbola and the axis OV between the limits $OA = v_1$ and $OB = v_2$. To solve this problem the area $AA'B'B$ may be imagined as made up of an infinite number of infinitely narrow strips. One such strip is roughly shown in the figure between the lines marked p and p' . The difference between p and p' would evidently be the greater, the greater the distance between them. But since the distance is supposed to be infinitely small, the two lines may be taken as equal and the strip may be considered as a rectangle. Calling its infinitely small base dv , the area of the rectangle is seen to be $p dv$. The total area $AA'B'B$ may now be obtained by summing up the infinite number of "differentials of area" like $p dv$ inclosed between the limits $OA = v_1$ and $OB = v_2$. The summation may be performed by the integral calculus and is denoted by a definite

integral, as follows: $AA'B'B = \int_{v_2}^{v_1} p dv$.

We have seen before that the result of this integration is $k \log \frac{v_1}{v_2}$. The required area therefore equals the natural logarithm of the ratio $\frac{OA}{OB}$, multiplied by the number (k) representing the product of any pair of coördinates, such as $OB \times BB'$, or $OA \times AA'$, etc. The calculus method is analogously employed whenever it is required to find the area inclosed by a given curve, elementary geometry being in most cases powerless to furnish the desired answer; and thus the calculus finds extensive application in the solution of many important problems of geometry.

The above sketch outlines the methods of reasoning by which the calculus attacks problems involving variable quantities. As to its limitations, it must be observed that while the differential calculus teaches how to differentiate readily any function whatever, the converse problem, viz., that of integrating a given differential, is often very difficult, requiring all manner of algebraic artifices, and is sometimes altogether impossible. In other words, in their studies of nature, scientists are often led to construct differentials (just as in our third problem we constructed the differential $p dv$) which they cannot integrate, because they can conceive no function which, on differentiation, would yield the given differential. Finally, it may be observed that the flour is no better than the grain, and if data that are made to pass through the mill of the calculus lead to doubtful results, it is the fault not of the calculus, but of the data; the calculus itself is as exact as any other branch of mathematics, in spite of the fact that the things it deals with seem so often to dwindle away into nothing.

History. The invention of the calculus method is generally referred to the latter half of the seventeenth century, but the course of its early development really leads much farther back.



sure and volumes of a gas whose temperature is kept constant (i.e., the law of Boyle and Mariotte) may be represented geometrically by a

Thus, the "method of exhaustion," which, as first applied, consisted in comparing the area bounded by a given curve with the area of an inscribed or circumscribed polygon whose number of sides is continually increased, is related to the present calculus through the doctrine of limits. Similarly, the surfaces of the sphere, cylinder, and cone were compared with prismatic and pyramidal surfaces. By this method Archimedes calculated the value of π , obtained the areas of the parabola, ellipse, and one of the spirals, and found the ratio of a spherical surface to the surface of the circumscribed cylinder. Kepler (1615) was the first to improve this method by introducing into geometry the idea of infinity. He considered the circle as composed of an infinite number of triangles (with their vertices at the centre and with their bases on the circumference), and the cone as composed of an infinite number of pyramids. The next advance is due to Cavalieri (q.v.), who effected quadrature by summing the infinitesimal elements into which he divided his areas, and established the properties of the centre of gravity relating to solids of revolution. So far the end sought by mathematicians was the solution of particular problems, as the rectification and quadrature of certain curves. Thus, also, Wallis extended the application of Cavalieri's method of indivisibles, Descartes (1637) increased its power by the introduction of coördinate geometry (see ANALYTIC GEOMETRY), and Fermat applied it to maxima and minima (q.v.). But it remained for Leibnitz and Newton to devise a general notation and to organize existing principles into a comprehensive science. The principles of Newton, which later appeared under the title of Fluxions (q.v.), were first published in his *Principia* (1687). The basal idea of his calculus is that of velocity. A line, surface, or solid, is conceived as generated respectively by a moving point, line, or surface. The velocity of a moving point, and its components along the axes of coördinates for successive intervals, were called fluxions. The velocity of the moving point was called the fluxion of the arc generated, and the arc the fluent of the point's velocity. The velocity of a moving point being regarded as constant, the ratio of its component fluxions determined the nature of the path described. In general, the relation between the fluxions being given, the relations between the coördinates of the point were sought, and conversely. The component of velocity (fluxion) along the X-axis was designated by x' [\dot{x}], or \dot{x} ; along the Y-axis by y' , [\dot{y}], or \dot{y} . Leibnitz used the symbol dx for an infinitesimal change in x , a symbolism which has endured, while Newton's fluxional notation disappeared in the first half of the nineteenth century. The first publication of Leibnitz's principles appeared in the *Acta Eruditorum* (Leipzig, 1684). His method differed from Newton's, not only in its symbolism, but also in its relation to pure number. The instantaneous changes in any continuously varying magnitude, regarded by Leibnitz as taking place by infinitely small differences, savor less of mechanics than do Newton's components of velocity. The basal idea, however, in the two systems is the same, and each calculus consists of two parts—(1) differential calculus, which investigates the rules for deducing the relation between the infinitely small differences of quantities from the relation which exists between the quantities themselves; (2) the integral calculus, which treats of the inverse problem, i.e.,

to determine the relation of the quantities when that of their differences is known.

The influence of the calculus has been so extensive on nearly all branches of mathematics that no attempt will be made in what follows to give other than the most prominent names associated with its development. The theory of infinitesimals, which lies at the foundation of differential calculus, has received adequate treatment at the hands of Gauss, Cauchy, Jordan, and Picard. With the development of the general theory of functions are connected the names of Clairaut, D'Alembert, Euler, Lagrange, Gauss, Cayley, Cauchy, Riemann, Weierstrass, and Lie; with elliptic and Abelian functions the names of Landen, Jakob Bernoulli, Maclaurin, D'Alembert, Legendre, Clebsch, Abel, Jacobi, Eisenstein, and Brioschi; with the theory of the potential, Lagrange, Green, Gauss, Dirichlet, Riemann, Neumann, Heine, and Beltrami; with differential equations, the Bernoullis, Riccati, Clairaut, Euler, Lagrange, Monge, Cauchy, Clebsch, Boole, and Lie; and with the calculus of variations, Jakob Bernoulli, l'Hôpital, Lagrange, Sarrus, Cauchy, Hesse, Clebsch, and Weierstrass.

Calculus is essentially a branch of the science of number. It differs from other branches of this science, as arithmetic and algebra, by regarding number as continuous, i.e., as being capable of gradual growth and of infinitesimal increase, while they deal with finite and discontinuous number. It differs from ordinary algebra in another respect; in the latter, the values of unknown quantities, and their relations with one another, are detected by aid of equations established between these quantities directly; in the calculus, on the other hand, the equations between the quantities are obtained by means of other equations primarily established, not between the quantities themselves, but between certain derivatives from them, or elements of them. This is an artifice of great value, since the relations between the quantities involved in any problem can, in general, more easily be inferred from equations between their derivatives than from those between themselves.

Calculus of Variations. The basis of this calculus is also a method of differentiation, but of a peculiar kind. In ordinary differential calculus we seek the form which $f(x)$ assumes when x receives an indefinitely small increment, dx . In the calculus of variations, we seek the laws of the changes attending a slight alteration of the form of the function, or in the transformation of one function into another. This calculus treats the so-called isoperimetrical problems, many of which were formerly insoluble. The method has extended application in higher physics.

Calculus of Finite Differences is a calculus concerned with the changes of functions due to finite changes in the variables involved, hence without the assumption of continuity. E , Δ , and Σ are important symbols, E denoting the operation of increasing the independent variable of a function by unity, Δ the corresponding increment of the function, and Σ the summation of all values of the function for integral values of the variable from unity to any desired number.

Calculus of Operations, as the term indicates, is a systematic method of treating problems by operating algebraically upon symbols of operation. If the symbol ϕ and ψ prefixed to a quantity represent operations of the same class, the law of operations is distributive (see

DISTRIBUTIVE LAW) when $\phi(x+y) = \phi(x) + \phi(y)$; the law is commutative (see ASSOCIATIVE LAW) when $\phi\{\psi(x)\} = \psi\{\phi(x)\}$. If ϕ^m represents the repetition m times of the operation ϕ , the law of indices in ordinary algebra is expressed by

$$\phi^m\{\phi^n(x)\} = \phi^{m+n}(x) = \phi^{n+m}(x) = \phi^n\{\phi^m(x)\}.$$

These laws are true for differentiation, for

$$\frac{d}{dx}(u+v) = \frac{d}{dx}(u) + \frac{d}{dx}(v), \text{ (distributive law)}$$

$$\frac{d}{dx}\left\{\frac{d}{dy}(u)\right\} = \frac{d}{dy}\left\{\frac{d}{dx}(u)\right\}, \text{ (commutative law)}$$

$$\frac{d^m}{dx^m} \frac{d^n}{dx^n}(u) = \frac{d^{m+n}}{dx^{m+n}}(u), \text{ (index law).}$$

Calculus of Probabilities. A systematic analytic treatment of the doctrine of probability (q.v.) by use of the differential and integral calculus.

Calculus of Functions (q.v.). A systematic method of determining functions which satisfy given conditions.

Calculus, Barycentric. A method of treating geometric problems based on the mechanical theory of centres of gravity. In this calculus Möbius (1827) furnished the first example of homogeneous coördinates. See COÖRDINATES.

Residual Calculus. A branch of integral calculus due to Cauchy, in which the integration takes place in the plane of complex numbers around a contour inclosing points for which the function is infinite. The integral is called the residual, and in case the contour contains all the critical points, the integral is called the total or principal residual.

Bibliography. The literature on the subject of calculus is so extensive that any limited selection of references must be unsatisfactory. The best selection of important works will be found in the *Encyklopädie der mathematischen Wissenschaften*, vol. ii (Leipzig, 1900). Of the older works the most important are: Leibnitz, *Mathematische Schriften*, ed. by Gerhardt (Berlin and Halle, 1849-63); Newton, *Opuscula* (Lausanne, 1714); Euler, *Introductio in analysin infinitorum* (new ed., Lausanne, 1848); id., *Institutiones calculi differentialis* (new ed., St. Petersburg, 1885); id., *Institutiones calculi integralis* (3d ed., Vienna, 1830). Of the later works may be mentioned those of Cauchy (Paris, 1821-47); Bertrand, *Traité de calcul différentiel et de calcul intégral* (Paris, 1864-70); Serret, *Cours de calcul différentiel et intégral* (4th ed., Paris, 1894); Hermite, *Cours d'analyse de l'école polytechnique* (Paris, 1873); Laurent, *Traité d'analyse* (Paris, 1885-91); and Jordan, *Cours d'analyse* (2d ed., Paris, 1893-96), which may be taken as typical of the best French works. In Germany and Austria, Schlömilch, *Compendium der höheren Analysis* (4th ed., Brunswick, 1895); Schlömilch, *Übungsbuch zum Studium der höheren Analysis* (4th ed., Leipzig, 1888); Lipschitz, *Lehrbuch der Analysis* (Bonn, 1877-80); Stolz, *Grundzüge der Differential- und Integralrechnung* (Leipzig, 1893-99); and Riemann, *Gesammelte Werke*, ed. by Weber and Dedekind (2d ed., Leipzig, 1892). In England, Price, *Treatise on Infinitesimal Calculus* (2d ed., 4 vols., Oxford, 1855-59); Todhunter, *Differential Calculus* (Cambridge, 1865) and *Integral Calculus* (Cambridge, 1868), are widely known. Italy has recently produced a work of merit, viz., Pascal, *Lezioni di analisi infinitesimale* (3 vols., Milan, 1895). Of the American works covering the general field, Byerly, *Elements of Differential*

Calculus and Elements of Integral Calculus (Boston, 1881), are representative. For the history of the subject, consult the *Encyklopädie* mentioned above; also, Cantor, *Geschichte der Mathematik*, vols. ii and iii (Leipzig, 1892-98); Ball, *History of Mathematics* (3d ed., New York, 1901); Fink, *History of Mathematics*, trans. by Beman and Smith (Chicago, 1900). The *Calculus of Variations* is treated historically, as well as mathematically, by Carll (New York, 1885). A recent treatise is Bolza, *Variationsrechnung* (Leipzig, 1909).

CALCULUS, or **STONE**. In medicine, a hard concretion formed within the animal body, in consequence of the deposition in the solid form of substances which usually remain in solution. (See CONCRETION.) The concretions most commonly termed "calculi" are those formed in the kidneys or bladder (urinary calculi), and those formed in the gall bladder or biliary ducts (biliary calculi). Both of these give rise to very painful symptoms and may even threaten life. Biliary calculi, or gallstones, are composed of cholesterolin, lime salts, epithelial debris, and bacteria. The latter set up a low-grade inflammation of the lining of the gall bladder, which encourages the formation of calculus. The presence of stone in the gall bladder (cholelithiasis) gives rise to indefinite symptoms of indigestion, transient jaundice, and a feeling of uneasiness in this region, but when it becomes impacted in the cystic or common bile ducts there ensues an attack of biliary colic. This begins with a sharp pain in the right hypochondriac or epigastric region, radiating back to the right shoulder blade. The pain soon becomes agonizing, with nausea and vomiting, and grave depression. The attack continues for several hours until the stone escapes into the intestine, and only a feeling of soreness remains. The pain of biliary colic is best relieved by injections of morphine, but hot fomentations over the epigastrium sometimes afford relief. Cholelithiasis is more common in women than in men.

Urinary calculus occurs at all ages, but is most common in advanced life and in the male sex. It is very frequent in gouty persons, or among those who pursue sedentary occupations and live freely. It is rare among those who live much in the open air, or who take much exercise and animal food and wine in moderation. Among sailors it is believed to be peculiarly rare. In certain parts of England the disease is said to be frequent, as in Norfolk; and perhaps along the eastern coast of Scotland. In India, too, where some of the predisposing circumstances mentioned above can hardly be said to prevail, stone is common. The predisposing causes of calculus are still imperfectly understood. In its early stages the condition usually presents itself in the form of gravel, shown by the passage of numerous very small particles of gritty concretion, which may be observed in the urine as a deposit like sand or like small grains of Cayenne pepper. When such deposits occur frequently—especially if they are present at the time of passing the urine, and not merely after it has cooled—there is reason to apprehend the subsequent formation of calculus. Renal calculi are composed of uric acid, oxalate of lime, or the phosphates of calcium, magnesium, and potassium. Uric acid calculi are dark red or brown in color and very hard. Phosphatic calculi are softer and grayish white in color. They may be formed in the substance or

in the pelvis of the kidney. The most common symptom of renal calculus is dull pain in the loins, aggravated by sudden shocks or jars. When the stone escapes into the ureter, there ensues an attack of agonizing pain starting in the lumbar region and radiating toward the umbilicus and downward and inward in the direction of the ureters. The attack often begins with a severe chill. Later, nausea and vomiting come on, feeble pulse and symptoms of collapse. After the paroxysm has ended, blood may be found in the urine. Subsequently the stone may escape through the urethra or remain lodged in the bladder.

Calculus in the bladder is at first attended with little suffering, as compared with that caused by the stone in its passage downward from the kidney; but unless removed or evacuated, the calculus is sure to enlarge, and it then becomes the cause of one of the most painful diseases that afflict humanity. The existence of a stone in the bladder, however, should never be assumed without a surgical examination, as all the symptoms are deceptive in certain cases. The most striking (and, perhaps, the most trustworthy) evidence of stone in the bladder, apart from the testimony of the sound (see *LITHOTOMY*), is smarting and burning pain experienced after the bladder has been emptied, together with occasional temporary stoppage in the flow of urine. The correct appreciation of all the symptoms, however, comes only from surgical experience.

The chief varieties of urinary deposits, with respect to chemical composition, are: (1) Uric acid (red deposit); (2) urates of ammonia, soda, lime, etc. (brick-dust sediment); (3) phosphates of ammonia and magnesia, lime, etc.; (4) oxalate of lime; (5) carbonate of lime (chiefly in domestic animals); (6) cystin; (7) xanthic oxide (a very rare form, discovered by Dr. Marcet). Calculi are frequently composed of numerous successive layers, each having a perfectly distinct chemical composition. Urates and phosphates in particular frequently succeed each other and form what is called an alternating calculus. When calculus has once fairly formed in the urinary passages, no absolute cure exists except removal (see *LITHOTOMY*; *LITHOTRITY*; *НЕФРОТОМИЯ*); but in the stage of gravel, and still more in the earlier stages detected by careful examination of the urine, much may be done to check the tendency to this distressing and dangerous malady. The chief remedies consist in careful regulation of the diet and mode of living, together with the use of solvents adapted to the particular form of deposit found to be habitually present. Consult Park, *Surgery by American Authors* (New York, 1901). See *URINE*.

Salivary calculi form in the glands or in their ducts, usually the latter. These concretions are rarely larger than a pea, and are composed chiefly of calcium phosphate or calcium carbonate. As in gallstone, the impetus to stone formation is given by bacterial irritation. The only treatment is surgical removal.

CALCUTTA (Hind. *Kali Ghātā*, the *ghāt*, or landing place leading to the temple of the goddess Kali). The capital of the Presidency of Bengal and metropolis of British India, situated on the east, or left, bank of the river Hooghly, an arm of the Ganges, in lat. 22° 34' N. and long. 88° 22' E., about 86 miles from the sea by the river (Map: India, E 4). Calcutta was,

until 1912, the headquarters of the government of India. In that year Delhi became the capital. Calcutta is built on a soil formed at a comparatively recent date by the alluvial deposits of the Gangetic delta. The climate is hot and moist; the average annual rainfall is 60 inches. Cyclones are frequent, the most disastrous occurring in 1737, when St. Anne's Church steeple was blown down; in 1842; in 1864, when 49 persons were killed and 172 vessels in the harbor were damaged. In the earthquake of June 12, 1897, the cathedral steeple was wrecked and 1300 houses were damaged.

Next to London, Calcutta with suburbs is the most populous city in the British Empire, and covers an area of 20,547 acres, of which only 1792 are rural, and 1113 acres form the Maidan. Calcutta proper includes the "old town" (3766 acres) and the "added area" (8188). Fort William stands in the centre of the town, surrounded by the beautiful park known as the Maidan. East of it is the European residential quarter and north of it the business district; south and east the European suburbs of Ballygunge and Alipore (the residence of the Governor of Bengal). Immediately surrounding the European quarters lies the native town, three-fifths of whose population live in tiled huts with mud or wattle walls crowded into narrow lanes which are tortuous, badly lighted, and amazingly dirty.

In strong contrast with this native city of hovels is the European town, proudly called the "city of palaces." Here stand the government house, built at the instance of the Marquis Wellesley at a cost of 13 lakhs of rupees and completed in 1804; to the west, the high court, a somewhat florid Gothic structure (1872); the town hall, Doric (1804); the mint, Doric, covering 1½ acres in the north of the town (1830); Victoria Memorial Hall, at the south end of the Maidan, a recent undertaking. Other buildings of interest are the post office (1870), Writers' Building, the Bank of Bengal, Metcalfe Hall, and various government offices. The Hindu temples and Mohammedan mosques have few claims to architectural merit, the only one of any pretensions being the one built (1842) by Prince Ghulam Muhammad. St. Paul's Cathedral (1839-47), which cost 7½ lakhs to build, is practically the work of Bishop Wilson. It is modified Gothic-Indo-Gothic. St. John's (begun 1784) occupies the site of the old church of St. Anne's, demolished 1756. There is a Roman Catholic cathedral (1797), a Greek church (1780), an Armenian (1790), and a Scottish church.

The Maidan contains numerous monuments. Other open spaces are Eden Gardens, Beadon Square, the Zoological Gardens (founded 1876) at Alipore, the Botanical Gardens at Sibpur (1786), beautifully laid out along the Hooghly, covering 272 acres, and stocked with rare tropical plants.

The supply of drinking water is obtained from the Hooghly River at Palta, 17 miles north of Calcutta, where it is filtered and piped to the city. Inaugurated in 1860 and designed to care for 6,000,000 gallons per diem, the works have been extended till they now furnish to Calcutta and the adjacent towns a per capita supply per diem of 21½ gallons. The streets are watered and the drains flushed with unfiltered water pumped up in the city. The underground drainage system (begun 1859) took 16 years to complete. Although additions have been made, the

system is inadequate, and considerable areas remain unsewered. The lighting system is good, gas and electricity being both used. There is an efficient street railway system, which has been electrified. In 1905 there were 300.43 miles of road, of which 117 were metalead. Four main roads running parallel with the river intersect the city—the Strand, Chowringhee, Russa, and Lower Circular roads. A spacious roadway marks the landward boundary of the city proper. Beyond this road there lie extensive suburbs, the chief of which are Cossipur-Chitpur, on the north; Maniktola, Ballygunge, Sealadah, and Intally on the east; Bhawanipur, Alipore, and Kidderpore on the south. The municipality of Howrah, situated on the opposite side of the river and connected with Calcutta by a pontoon bridge, contains the salt golahs or warehouses of the government, extensive manufactories, dock-yards, shipbuilding establishments, and the depot of the East India Railway.

Port William is included in the Lucknow division of the Eastern Command; the garrison, in addition to volunteer forces, includes a battalion of British infantry, a battery of garrison artillery, a company of the Indian submarine mining corps, and a regiment of native infantry in the fort, besides half a squadron of native cavalry and a regiment of native infantry at Alipore.

The principal scientific and literary societies of Calcutta are the Bengal Asiatic Society, founded in 1784 by Sir William Jones, possessing a fine library, and a valuable and extensive museum; the Bethune Society; the Dalhousie Institute, and the Bengal Social Science Association. The University of Calcutta, though only an examining body, exercises paramount influence over English education throughout Bengal. Colleges are established to prepare candidates for examination. Other educational institutions are numerous in Calcutta. The principal places for religious instruction are Bishop's College, intended chiefly for the education of missionaries and teachers, and the institutions of the Established and Free churches of Scotland for the same purpose.

Three great railways converge on Calcutta. The East Indian Railway connects with Bombay, the United Provinces, and the Punjab, and is the outlet for the Ganges valley trade. The Bengal-Nagpur Railway runs through Orissa to Madras and west to Bombay. The Eastern Bengal State Railway connects with north and east Bengal and Assam and with Diamond Harbor. The first and last of these lines terminate on the west bank of the river at Howrah, whence a bridge and ferries connect with Calcutta.

Traffic is not monopolized by the railways. Besides native craft, the vessels of several large steamship companies navigate the inland waters and carry an extensive coasting trade to the Orissa ports. Continuous communication, greatly facilitated by the Suez Canal, is kept up with Great Britain by numerous well-appointed steamers and by sailing vessels. The river adjacent to the city varies in breadth from a quarter of a mile to nearly a mile. There are dry docks and wet docks. The city has water communication in three directions—to the east by various rivers leading to the Brahmaputra; to the north by the Hooghly and the Nadiya rivers leading to the Ganges; to the west by the Midnapur Canal. The port was transferred from government management to that of a port

trust of 12 (now 15) commissioners in 1870. There are six unloading berths for seagoing vessels at the jetties, with a frontage of 2982 feet, and all the loading is done separately at the Kidderpore docks. The petroleum wharf was established in 1886 and the tea warehouse in 1887. The port commissioners (made in 1889 conservators of the port) have their own dock-yard and workshop; they maintain a staff of assistant harbor masters, who take over the pilotage of all vessels from Garden Reach; they license all cargo boats, pay three-fourths of the cost of the harbor police, survey and prepare charts of the river, from Calcutta to the sea, and are responsible for the lighting of the Hooghly. They levy a toll of 4 annas a ton on all goods shipped or discharged. The shipping, estimated at 10,000 tons in 1727, increased to 1,553,575 tons entered in 1886-87, 1,912,681 in 1891-92, 2,869,700 in 1901-02, 3,174,946 in 1903-04. Steamers have largely replaced sailing vessels, of which there were 465 in 1886-87, and only 87 in 1903-04. The coasting trade increased from 1,410,000 tons in 1886-87 to 3,317,000 tons in 1903-04.

Over a third of the entire foreign trade of India passes through Calcutta. The imports increased from £21,773,290 in 1902-03 to £34,651,817 in 1911-12, and the exports from £34,691,389 to £57,247,815. It was as the only seaport from which the rich products of Bengal could be exported that Calcutta came into prominence as a trading town. The export of jute has increased enormously since 1850, as has also that of oil seeds and tea. Bengal coal is in demand throughout India. Other exported products are opium, hides and skins, grain and pulse, indigo, lac, raw cotton and silk, saltpetre, and oils. More than half the export trade is with Europe; the United Kingdom, Germany, the United States, and China are important countries of destination. About seven-eighths of the imports (cotton textiles, treasure, metals, oil, sugar, machinery, woolen goods, hardware, railway materials, etc.) come from Europe—three-fourths from the United Kingdom. The coasting trade is enormous, and in the internal trade Calcutta is the distributing centre for Bengal. The principal industrial establishments include sugar refineries, cotton manufactories, flour, saw, and oil mills, and shipbuilding docks. Several newspapers are published. There are a few banks and numerous insurance and other companies, with a chamber of commerce. Living is comparatively cheap, and most of the luxuries of life, as well as its necessities, are to be had as readily as in most European towns.

The first complete census was taken in 1876, when the population numbered 611,784; it grew to 612,307 in 1881, 682,305 in 1891, and 847,796 in 1901. In 1911 the total population with suburbs was 1,222,313 (1,106,738 in 1901), detailed as follows: Calcutta proper, 896,061 (847,796 in 1901); Howrah, 179,006 (157,594); Cossipur-Chitpur, 48,178 (40,750); Maniktola, 53,767 (32,387); Garden Reach, 45,295 (28,211). The preponderance of males (812,433 in 1911 to 409,880 females; 607,674 to 288,393 in Calcutta proper) is due to the large number of immigrants. Judged by European standards, the city is seriously overcrowded. Though in normal years the city is fairly healthy, the mortality is frequently greatly increased by plague, which in 1903 accounted for 8222 deaths out of 29,765. Fever, dysentery, cholera, and respiratory dis-

eases prevail. Of the total inhabitants, 65 per cent are Hindu, 29.4 Mohammedan, 4 Christian, the remainder Buddhists, Jews, etc. Europeans, Eurasians, Chinese, and negroes figure in the population, which is largely recruited from Bengal and other parts of India. Calcutta is the birthplace of William Makepeace Thackeray.

Job Charnock, of the English East India Company, laid the foundation, in 1690, of modern Calcutta, by invitation of the Nawab. In 1698 the East India Company purchased it, with two other villages, from the Governor of Hooghly, and in 1707 declared it a separate presidency. The chief event in its early history was its capture in 1756 by Suraj-ud-Dowlah, then Nawab of Bengal. The native troops deserted, and the whites were driven into the fort, whence the Governor and many of his staff escaped to the ships. The garrison, under Holwell, surrendered June 20, and were crowded into the Black Hole (q.v.)—a room 18×14 feet with two tiny grated windows to give air to the packed mass of humanity—during a night of extreme heat. In the morning, out of 146 persons, only 23 were found alive. The town was recaptured by Clive and Admiral Watson early in 1757, since which time it has enjoyed uninterrupted prosperity. The history of municipal administration dates from 1727, when its first corporation came into existence. In 1876 a new corporation was created, replaced in 1900 by a corporation, general committee, and chairman, as provided in the Bengal Act III of 1899. Consult Stevens, "The Port of Calcutta," in *Society of Arts Journal*, vol. xlvii (London, 1899); Stevenson, "Calcutta," in *Outing*, vol. xxxi (New York, 1900); Cotton, *Calcutta Old and New* (Calcutta, 1907).

CALDANI, kâl-dâ'nê, LEOPOLDO MARC ANTONIO (1725-1813). An Italian anatomist, born in Bologna, where for several years he taught practical medicine. In 1771, on the death of Morgagni, the celebrated anatomist of Padua, Caldani was chosen his successor in the professorship, and continued to lecture until 1805. At the age of 76 he published his principal work, *Icones Anatomicæ*, a series of anatomical plates. He also published *Institutiones Physiologicae* (1772) and other works.

CALDARA, kâl-dâ'râ, ANTONIO (1670-1736). An Italian composer, born in Venice. He studied there under Legrenzi and became a singer in the chapel of San Marco. In 1714 he was appointed *maestro di cappella* in Mantua, and from there went to Vienna, where Charles VI made him one of his vice chapelmasters and took lessons from him. Caldara is noted rather for the quantity than the quality of his works. He was a prolific composer, and his orchestration was often very elaborate. He composed 74 operas and 32 oratorios, all forgotten to-day. But his masses, motets, and chamber music are on a higher level.

CALDARA, POLIDORO. See POLIDORO DA CARAVAGGIO.

CALDARIUM. A town in ancient Italy. See CALDIERO.

CALDARIUM, or **CALIDARIUM**. See BATH, *Rome*.

CALDAS, kâl'dâs (Sp. plur. of *calda*, Lat. *calida*, warm water, Lat. *calidus*, hot). A Spanish term for warm springs applied to numerous places on the Iberian Peninsula on account of their thermal springs. The chief of them are Caldas de Malavella, Caldas d'Estrach, and Caldas de Montbuy, in Catalonia; Caldas de Reyes,

Caldas de Taipas, Caldas de Faveios, Caldas de Rainha, Caldas de Gerez, in Portugal. The name is also common in the topography of South America, as Caldas de Minas Geraes, Brazil.

CALDAS, FRANCISCO JOSÉ DE (1771-1816). A Colombian naturalist, born at Popayan, New Granada. He traveled extensively through that country and Peru and in 1804, by means of a barometer and a sextant constructed by himself, measured Mount Chimborazo, Mount Tungueragua, and several other peaks. He was in charge of the observatory established at the beginning of the century at Santa Fé de Bogotá, and his valuable observations were published in the *Semenario de la Nueva Granada*, the first number of which was issued in 1807 (republished by A. Lasserre, Paris, 1849). In the revolution of 1816 Caldas was condemned to death by Morillo and executed for championing the cause of independence.

CALDAS-BARBOSA, DOMINGOS (1740-1800). A Brazilian poet. He was born in Rio de Janeiro and was the son of a freed negress. He entered the army, participated in the siege of Colonia do Sacramento in 1762, and afterward went to Lisbon, where he took holy orders and was protected by the Count of Pombeiro, in whose palace he lived. He was endowed with a considerable gift for improvisation and became very popular in high society in Lisbon. His poems are tinged with melancholy and are somewhat pessimistic in tone. Many of them have been collected and published under the title, *A Viola de Loreno*.

CALDECOTT, kâl'de-kot, ALFRED (1850-). An English educator, born in Chester. Educated at the universities of Edinburgh, Cambridge, and London, he was principal in Codrington College, Barbados, Tripos examiner at Cambridge, and for a time examining chaplain to the Bishop of St. Albans. Later he became professor of philosophy, and dean (1912) of King's College, London. His publications include: *English Colonisation and Empire* (1890; Jap. trans., 1909); *English Church in the West Indies* (1898); *The Philosophy of Religion in England* (1901); *Selections from the Literature of Theism* (1904); also essays in *Cambridge Theological Essays* (1905) and *London Theological Essays* (1911).

CALDECOTT, kâl'de-kot, RANDOLPH (1846-86). An English illustrator, born in Chester. In early life he was a bank clerk in Manchester. He came to London in 1872 and studied painting at the Slade School of Art under Poynter, and modeling with Jules Dalou at Chelsea, contributing regularly to the magazines. His first important illustrations were done for Washington Irving's *Old Christmas* (1875). Among others are those for Irving's *Bracebridge Hall* (1876), and for books by Mrs. Ewing and Mrs. Locker. But his best work is a series of children's picture books, illustrated in color. The series began with *John Gilpin* (1878) and ended with *The Great Panjandrum Himself* (1885). He excelled especially in portraying English country life, especially of the latter half of the eighteenth century. His illustrations are simple and effective, full of humor and quaint fancies. The British Museum contains a large collection of them.

CALDER, kâl'dêr, ALEXANDER STIRLING (1870-). An American sculptor. He was born in Philadelphia, studied at the Pennsylvania Academy and in Paris under Chapu and

Falguière. After his return to Philadelphia he became instructor in the School of Industrial Art in that city. He combines technical ability with originality of conception and a fine discrimination in the choice of simple decorative motives, and is always plain and straightforward both in his treatment of material and grasp of subject. His first important commission was the statue of Dr. Samuel D. Gross, in front of the Army and Medical Museum, Washington, one of the finest monuments in that city. The six heroic figures of representative Presbyterian theologians, over the entrance to the Witherspoon Building in Philadelphia, are full of character and individuality. His fountain for the class of 1892, University of Pennsylvania, is a good example of his style, and among his ideal works "Narcissus," "The Man Cub," "The Dozing Hercules," "The Miner," "Primeval Discontent" (a powerful study of the nude), are especially deserving of mention. He is represented in the St. Louis Museum of Fine Arts, the Philadelphia Academy, Franklin Inn Club, and Throop Institute, Pasadena. One of the best designs for a figure and pedestal ever produced in America is his sketch model for a monument to Matthias W. Baldwin. His father, ALEXANDER MILNE CALDER (1846-1923), born in Aberdeen, Scotland, came to America at the age of 22. He furnished most of the sculptural decorations in the City Hall, Philadelphia, and a statue of General Meade in Fairmount Park, Philadelphia.

CALDER, JAMES ALEXANDER (1868-). A Canadian lawyer and statesman, born at Ingersoll, Ont. He studied at the Ingersoll high school and at Manitoba College, Winnipeg. He was principal of the Moosejaw, Saskatchewan, high school in 1891-94, inspector of schools in the Northwest Territories in 1894-1900, and of that region also deputy commissioner of education in 1901-05. He entered politics in 1905 and was called to the bar in 1906. He first sat as a Liberal member for Regina, the capital of Saskatchewan, in the Legislative Assembly (1905-08) and in 1908 became member for Saltcoats. In the Liberal administration of Walter Scott (q.v.) he was in 1905 appointed Provincial Treasurer and Commissioner of Education. He was a member of the Interprovincial Conference at Ottawa in 1906, and in 1909 a member of the Royal Conservation Commission.

CALDERA, kál-dá-rá (Sp., kettle, Eng. *cal-dron*, referring to the hollow depression of volcanic origin). A seaport of Chile, in the Province of Atacama, 25 miles from Copiapó, lat. 27° 5' S. (Map: Chile, C 9). It has an excellent harbor, protected by breakwaters, and exports silver and copper, being the port for the productive mining district centring at Copiapó, with which it is connected by railroad, the first constructed in Chile, and one of the first in South America. There are silver and copper smelters here. The town is the seat of a United States consular agent. Pop., 1903, 2130.

CALDERON, BRIDGE OF. See PUENTE DE CALDERON.

CALDERÓN, DON SERAFÍN ESTÉBANEZ. See ESTÉBANEZ CALDERÓN, DON SERAFÍN.

CALDERÓN, kál'dá-rón', FRANCISCO GARCÍA (1832-1905). A Peruvian statesman, born in Arequipa. He was elected to the Peruvian Congress (1867), and became Minister of the Treasury (1868). After the occupation of Lima by the Chilean army (1881), and the flight of Presi-

dent Piérola, Calderón was elected Provisional President of Peru. In this capacity he attempted to treat with the Chileans and to secure the co-operation of the United States, which, along with Switzerland and the Central American Republics, had recognized his government. These plans were frustrated by the Chileans, who sent him to Valparaíso as a prisoner. Upon his return to Lima in 1886, he became President of the Senate and rector of the University of San Marcos, the most ancient university in the New World. Aided zealously by the professors, he worked hard for its restoration, and by the end of 1886 the buildings were again in use and there was a solemn distribution of prizes to the students. He was influential in arranging the Grace contract, by means of which great improvements were made in the finances of Peru, to such an extent that her foreign debt was wiped out and her future prosperity, in all human probability, assured. His principal publication is the *Dictionary of Peruvian Jurisprudence*, a standard work of great erudition. Consult C. R. Markham, *History of Peru* (Chicago, 1892).

CALDERON, kál'dér-on, PHILIPPE HERMOGENE (1833-98). An historical, genre, and portrait painter. He was born in Poitiers, of Spanish parentage, but passed most of his life in England. He studied under J. M. Leigh in London and under Picot in Paris. In 1858 he made his début at the Royal Academy with "By the Waters of Babylon." "Broken Vows," exhibited in 1857, shows a leaning towards the Pre-Raphaelite style, which he temporarily adopted. His best works include "Her Most High Noble and Puissant Grace" (Leeds), "British Embassy in Paris during the Massacre of St. Bartholomew" (1863), "Renunciation of St. Elizabeth of Hungary" (1891, National Gallery of British Art)—his masterpiece. Calderon belongs to the group of the painters of St. John's Wood School, and was keeper of the Royal Academy from 1867 to his death. His pictures are a combination of French technique and English sentiment, rendered with good dramatic effect.

CALDERÓN DE LA BARCA, kál'dá-rón' dá lá bär'ká, PEDRO (1600-81). An eminent Spanish dramatic poet, next to Lope de Vega, Spain's greatest dramatist, and the most typically national Spanish writer of his century. He came of a good old family, and was born Jan. 17, 1600, in Madrid, where his father was secretary in the Department of the Treasury. His mother, who was descended from a distinguished family in Hainaut, died in 1610; and his father died in 1615. The poet was educated at the Jesuit college of his native city, and later studied law for a time in Salamanca. His first play was written at the age of 13, and at 22 he took part in a poetical contest held in honor of St. Isidore at Madrid, and won a prize with a poem which called forth warm praise from Lope de Vega. His biographer, Vera Tassis, states that the 10 years from 1625 to 1635, or thereabouts (there is some discrepancy in the dates), were spent doing military service in Italy and Flanders, but this statement cannot be maintained in the face of numerous legal documents that prove Calderón's presence in Madrid during those years. In 1636 his brother José edited a volume of his comedias, which contains some of the plays that have enjoyed the most enduring fame: *La vida es sueño*, *El purgatorio de San Patricio*, *La devoción de la cruz*, *La dama duende*, and *Peor*

está que estaba. In 1637 Philip IV, who had already commissioned him for a series of plays for the royal theatre in the Buen Retiro, made him a Knight of the Order of Santiago. In 1640 he had to interrupt the composition of a play in order to join his fellow knights in a campaign against the Catalan rebels. He rendered conspicuous and gallant service at Tarragona, which led to his receiving a special military pension in 1645, three years after he had retired from the army through ill health. The deep grief that he felt at the death (1648) of his mistress drove him to religion for consolation, and in 1650 he became a tertiary of the Order of St. Francis. In 1651 he followed the example of Lope de Vega and entered the priesthood, becoming successively chaplain at Toledo, honorary chaplain to Philip IV and superior of the Brotherhood of San Pedro in Madrid. Yet he still continued to write for the stage, and when he died, May 5, 1681, he was engaged upon a new *auto sacramental*, a form of religious play in which he excelled all his predecessors. His last secular play, *Hado y Divisa de Leonido y Marfisa*, to celebrate the marriage of Charles II to Marie-Louise de Bourbon, was also written during the last year of his life. His friend De Solís wrote of him, "He died, as they say the swan dies, singing."

With Calderón the golden period of Spanish drama comes to a close. He found it at its height, and he exhausted, one after another, the possibilities of its several types. As to the rank which should be assigned him, it must be borne in mind that he wrote not for the world, but for the narrow circle of his own age and country. He was essentially, fundamentally local; he lacked the universality, the wide humanity of Shakespeare, to whom, curiously enough, Friedrich Schlegel found him superior. He lacked the gift of finely differentiating his characters. They stand less for individuals than for personifications of certain primitive and dominant passions, love, hate, pride, charity, revenge, and above all else, for the personification of those fundamental passions as found in cultural conditions of the time and society in which he lived. And yet, despite all this, he has created some characters that stand out in splendid individuality. His leading motives are limited in number; they almost narrow down to the three sentiments of loyalty to the King, devotion to the Church, and the "point of honor," or vengeance inflicted by husband, father, or brother upon an erring woman. Perhaps nothing serves better to illustrate his circumscribed outlook upon life than the plays in which this last theme is treated. His heroes have nothing of the lofty passion of an Othello, the sublimity of a noble nature gone astray. They are likely to impress one rather as cold-blooded executioners, sensitive only to the fear of being made to appear absurd. And yet, if we would only take time and trouble thoroughly to absorb the idea that to a Spaniard's mind a Christian gentleman must be *cristiano, valiente y comedido*, not merely Christian and valiant, but also "measured" and "self-controlled"; that the height of absurdity was the failure to remain *comedido*; and that one could not be considered "measured" or "self-controlled" if he had not a calm and due regard for his honor as then understood—if we would only take time properly to weigh all these elements, we should probably conclude that this fear of being, or of

being made to appear, absurd is after all a legitimate dramatic force; and we all do recognize that, *mutatis mutandis*, it is one of the most potent forces with which we work in modern society.

Many critics think that Calderón was at his best as a writer of *autos*, or religious plays, which closely resemble the mystery plays of the Middle Ages, and in their more specialized form are a sort of dramatized exposition of the mystery of the blessed eucharist, intended for performance on Corpus Christi Day. Of these *autos*, nearly 80 are extant, although the number varies in different authorities, who sometimes fail to distinguish between the *auto* and the more secular *comedia devota*. Of the regular dramas, there are about 120 surviving, among which are *El Alcalde de Zalamea*; *El príncipe constante*; *La dama duende*; *El médico de su honra*; *El pintor de su deshonra*; *El mayor monstruo los celos*, and *La vida es sueño*.

Editions of Calderón are: Keil's (Leipzig, 1827); Hartzzenbusch's (Madrid, Rivadeneyra, 4 vols., 1872-74); and García Ramón (Madrid, 1882); a German translation of the plays, by J. D. Gries (9 vols., Berlin, 1862). There are English translations of selected plays by M'Carthy (1854-73); Edward FitzGerald (3 vols., 1853), and *Six Dramas of Calderón freely translated by E. FitzGerald*, edited by H. Oelsner (London, 1903). There is also an annotated edition of three plays, made by N. MacColl (London, 1888). Consult: Schmidt, *Die Schauspiele Calderóns* (Elberfeld, 1857); Trench, *Essay on the Life and Genius of Calderón* (London, 1880); Menéndez y Pelayo, *Calderón y su teatro* (Madrid, 1881); Rubió y Lluch, *El sentimiento del honor en el teatro de Calderón* (Barcelona, 1882); Güntliner, *Calderón und seine Werke* (Freiburg, 1888); C. Pérez Pastor, *Documentos para la Biografía de D. P. Calderón de la Barca* vol. i (Madrid, 1905); H. Breymann, *Calderón-Studien*, I: *Die Calderón Literatur* (Munich, 1905).

CALDERON THE COURTIER. A story of Spanish romance by Bulwer Lytton (1838).

CALDERWOOD, kal'dér-wud, DAVID (1575-1650). A Scottish divine and ecclesiastical historian. He was born in Dalkeith, of a good family, and about 1604 was settled as Presbyterian minister of Crailing, Roxburghshire, a few miles southeast of Edinburgh. Opposed to the designs of James VI for the establishment of episcopacy in Scotland, on that monarch's visit to his native country in 1617, he and other ministers signed a protest against a bill, then before the Scottish Parliament, for granting the power of framing new laws for the Church to an ecclesiastical council appointed by the King, and in consequence he was summoned before the high commission of St. Andrews. Refusing to submit, he was committed to prison for contumacy and then banished the kingdom. He retired to Holland, 1619, and in 1621, in English, and in 1623, in Latin, published at Leyden, under the pseudonym Edwardus Didoclavius, an anagram on his name, Latinized, his celebrated controversial work, entitled *Altare Damascenum* etc., in which he rigorously examined the origin and authority of episcopacy, and which has been a storehouse of information and argument in favor of Presbyterianism. After King James's death, in 1625, he returned to Scotland, and for some years was engaged collecting all the memorials relating to the ecclesiastical affairs of

Scotland, from the beginning of the Reformation there to the death of James VI. In 1640 he became minister of Pencaitland, near Edinburgh, and in 1643 was appointed one of the committee for drawing up the Directory for Public Worship in Scotland. He died at Jedburg, Oct. 29, 1650. From the original manuscript of his *History of the Kirk of Scotland*, preserved in the British Museum, an edition, with a life, by the Rev. Thomas Thomson, was printed for the Woodrow Society (in 8 vols., Edinburgh, 1842-49).

CALDERWOOD, HENRY (1830-97). A Scottish United Presbyterian clergyman and philosopher, born at Peebles. He was educated at Edinburgh University in 1847-52, studied theology, 1852-56, and was minister of Greyfriars Church, Glasgow, in 1856-58. He was examiner in mental philosophy at Glasgow from 1861 to 1864, and from 1868 until his death was professor of moral philosophy at Edinburgh. His metaphysics were of the Scottish intuitive realist school, but his *Philosophy of the Infinite* (1854) criticises Hamilton's dictum that the infinite is unknowable. Among his other works were: *Handbook of Moral Philosophy* (1872); *The Relations of Mind and Brain* (1879); *The Relations of Science and Religion* (1881); and a *Life of David Hume* (1898) with a particularly valuable treatment of Hume's attitude towards religion. He was an earnest worker for educational and temperance reform. Consult the biography (London, 1900) by his son, W. C. Calderwood, and D. Woodside, containing a chapter on Calderwood's philosophy by A. S. Pringle-Pattison.

CALDICOTT, kal'di-kot, ALFRED JAMES (1842-97). An English musician and composer, born in Worcester. He studied at the Leipzig Conservatory under Richter, Moscheles, and others; became organist of St. Stephen's Church, Worcester, and in 1882 was appointed to a professorship at the Royal College of Music, London. From 1892 until his death he was director of the London College of Music. His works include many songs and glees; the cantatas *The Widow of Nain* (1881) and *A Rhine Legend* (1883); and the operettas *A Moss-Rose Rent* (1883) and *Old Knockles* (1884).

CALDERO, kál-dyá-ró (anciently, Lat. *Caldarium*, hot baths, from *calidus*, warm). A decayed town in the Province of Verona, north Italy, 8 miles east of Verona (Map: Italy, F 2). Its hot sulphur springs were known to the Romans, hence the name "Caldarium." Here on Nov. 12, 1796, the Austrians repulsed Napoleon, and on Oct. 29-31, 1805, a series of bloody battles between the Austrians under Archduke Charles and the French under Masséna occurred. Pop., 1910, 2729.

CALDWELL. A city and the county seat of Canyon Co., Idaho, 26 miles (direct) west of Boise, on the Oregon Short Line Railroad (Map: Idaho, B 6). It is the seat of the College of Idaho and contains a Carnegie library, a fine courthouse, and a city hall building. The city is in a rich agricultural region, included in the Payett-Boise Reclamation project, and produces fruit, flour, cereals, live stock, potatoes, and cattle. The water works are owned by the municipality. Pop., 1900, 997; 1910, 3543. It was here that ex-Governor Steunenberg was assassinated, on Dec. 30, 1906, by Harry Orchard, who later confessed and was sentenced to life imprisonment.

CALDWELL. A village and the county seat of Noble Co., Ohio, 35 miles north of Marietta, on the Cleveland and Marietta and the Ohio River and Western railroads (Map: Ohio, H 6). It is in a coal-mining and oil-producing region. The water works and electric light plant are owned by the village. Pop., 1900, 927; 1910, 1430.

CALDWELL. A town and the county seat of Burleson Co., Tex., 87 miles east-northeast of Austin, on the Gulf, Colorado, and Santa Fe Railroad (Map: Texas, F 4). It is in a cotton and stock-raising region, and contains brickyards, cotton-gin, grist and oil mills, ice factory, etc. Pop., 1900, 1535; 1910, 1476.

CALDWELL, CHARLES HENRY BROMEDGE (1823-77). An American naval officer. He was born in Hingham, Mass., and entered the United States navy in 1838. He took part in the bombardment of Forts Jackson and St. Philip in 1862, and commanded the mortar flotilla in the operations at Port Hudson in 1863. In 1870 he became chief of staff in the North Atlantic squadron, and commodore in 1874.

CALDWELL, EUGENE WILSON (1870-). An American physician, born at Savannah, Mo. He was educated at the University of Kansas, and at the Bellevue Hospital Medical College. In 1893-95 he engaged in wireless telephony experiments for the United States Lighthouse Establishment. He invented the Caldwell Liquid Interrupter, experimented widely with Röntgen rays, and is joint author of *The Röntgen Rays in Therapeutics and Diagnosis*, with W. A. Pusey (1903).

CALDWELL, JAMES (1734-81). An American clergyman, called "the soldier's parson." He was born in Virginia, graduated at Princeton in 1759, became pastor of the Presbyterian Church at Elizabethtown, N. J., in 1762, and was a trustee of Princeton from 1769 to his death. He was a zealous patriot during the Revolution and served in 1776 as chaplain of the Third New Jersey battalion and later as assistant quartermaster-general. In 1780 the Tories burned his house and church, and soon afterward a British force from Staten Island murdered his wife at Connecticut Farms (now Union), N. J. Caldwell is said to have distributed hymn books to soldiers who were short of wadding, with the exhortation, "Now, boys, put Watts into them." He was shot and killed by a sentinel during a dispute about a package that the soldier declared it his duty to examine. The soldier was tried by the civil authorities for murder and was convicted and executed. A monument to Caldwell was dedicated at Elizabethtown in 1846.

CALDWELL, OTIS WILLIAM (1869-). An American botanist, born at Lebanon, Ind. He was educated at Franklin (Ind.) College, and the University of Chicago, was professor of botany at the Eastern Illinois State Normal School from 1899 to 1907, and in the latter year became associate professor of botany at the University of Chicago. He was also professor of botany in the University of Indiana Summer School in 1904. His publications include: *A Laboratory Manual of Botany* (1901; rev. ed., 1902); *Plant Morphology* (1903; rev. ed., 1904); *The High School Course in Botany* (1909); *Practical Botany* (1911); also a number of special articles in the National Educational Association's *Journal of Proceedings and Addresses*, including "The Influence of Prolonged and Carefully Directed Work" (1912).

CALDWELL, SAMUEL LUNT (1820-89). An American Baptist educator. He was born in Newburyport, Mass., and graduated from Waterville (now Colby) College in 1839, and from Newton Theological Institution in 1845. He held pastorates in Bangor, Me., and Providence, R. I., and was professor of church history at the Newton Seminary from 1873 to 1878. He then became the second president of Vassar College, and held this position until 1885. He was secretary to the corporation of Brown University in 1875-89.

CALDWELL, WILLIAM (1863-). A Canadian educator, born in Edinburgh, Scotland, and educated at Edinburgh University. He took postgraduate studies in German, French, and English universities, and in 1887 was appointed assistant professor of logic and metaphysics in Edinburgh University. He was government examiner in philosophy in the University of St. Andrews in 1889-92. In 1891 he received a call to a professorship in the Sage School of Philosophy, Cornell University. He joined the faculty of Chicago University the following year, in 1894-1903 was professor of moral and social philosophy in Northwestern University, and was then appointed Macdonald professor of moral philosophy in McGill University, Montreal. His principal publications are: *Schopenhauer's System in its Philosophical Significance* (1896); *Pragmatism and Idealism* (1913); and contributions to the leading psychological and philosophical reviews.

CALEB (dog). The name both of an individual and of a Kenizzite clan, mentioned in 1 Sam. xxv. 3; Num. xxxii. 12; Judg. i. 15; 1 Chron. ii. 9 et seq. The clan was probably of Edomite origin. Before the time of David (c.1033-993 B.C.) it was established in Hebron and its neighborhood. Caleb ben Jephunneh is the eponymous hero of the clan, representing its advance from Arabia into the Negeb. In the story of the spies (Num. xiii. 6) it even represents Judah. Post-exilic genealogies connect Caleb closely with Jerahmeel, as a younger brother, and both through Hezron and Perez with Judah. It is possible that these genealogies reflect vaguely the outlines of a history, of which northwestern Arabia and the Negeb were the scenes, before the different elements were welded together into the Kingdom of Judah by David. Consult: Moore, *Judges* (1895); Ed. Meyer, *Die Entstehung des Judentums* (1896); id., *Die Israeliten und ihre Nachbarstämme* (1906).

CALEB WILLIAMS. A novel by William Godwin, published in May, 1794. It is a study in the relativity of ethics. For the plot, see **FALKLAND**. It was dramatized by Colman the Younger. See **IRON CHEST, THE**.

CALEDONIA (Lat., Gk. Καλῶνία, *Kalēdonia*, still retained in Cymr. *Coesd Celyddon*, Caledonian Forest). The name given to the northern part of Britannia, beyond the firths of Forth and Clyde, by Tacitus and the later Romans. The derivation is very uncertain. Agricola attempted the conquest of Caledonia, which he invaded in 82 A.D. and the following years. In 84 he defeated Calgacus, who had formed a union of all the tribes, but was prevented, by his recall, from pursuing the conquest. Later Hadrian, Septimius Severus, and others attempted to subdue Caledonia, but the inhabitants succeeded in maintaining their independence. The natives made constant incursions into Britain. In the fourth and fifth centuries, under the names of

Scots and Picts, they preyed upon the Britons, especially after the withdrawal of the Roman legions, until the island was occupied by the Angles and Saxons. See **BRITANNIA**; **SCOTLAND**.

CALEDONIA, NEW. See **NEW CALEDONIA**.

CALEDONIAN CANAL. A chain of natural lakes in Scotland, 62 miles long, united by artificial canals and traversing the Great Glen of Albin, in Inverness-shire, from northeast to southwest, from Beaully Firth to near Fort William, and connecting the North Sea with the Irish Sea. The lakes are Beaully, Ness, Oich, Lochy, Eil, and Linnhe (Map: Scotland, D 2). They communicate by cuts 120 feet broad at the surface, 50 feet at the bottom, and 17 feet deep, the total length of these artificial channels being 23 miles. The canal was formed to avoid dangerous and tedious navigation by the Pentland Firth, Cape Wrath, and the Hebrides; the distance between Kinnaird's Head and the Sound of Mull by this route being 500 miles, but by the canal 250, with an average saving of 9½ days for sailing vessels. The highest part is Loch Oich, 105 feet above the sea. There are 28 locks, each 170 to 180 feet long, and 40 feet wide, with a rise or lift of water of 8 feet. Eight of the locks, called Neptune's Staircase, occur in succession near the west end of the canal. Begun under Telford, in 1803, the canal was opened in 1823. Ships of 500 to 600 tons can pass through. It is chiefly used by fishing boats and for local traffic, and in the summer season is much frequented by tourists attracted by the picturesque scenery and points of interest on both sides of the canal.

CALEDONIA SPRINGS. A health resort in Prescott Co., Ontario, Canada, and 66 miles west of Montreal on the Canadian Pacific Railroad. The town is famous for its alkaline springs.

CALEF, or CALFE, ROBERT (c.1648-1719). A Boston merchant, who published in 1700 *More Wonders of the Invisible World*, a reply to Cotton Mather's *Wonders of the Invisible World* (1692). His argument against the witchcraft persecutions and his attack on Mather were prompted, in part at least, by political reasons and had the backing of the Liberal party in Boston, especially William and Thomas Brattle. Mather's parishioners published a defense of him. Calef's book was publicly burned at Cambridge by order of Increase Mather, then president of Harvard College.

CALENDAR (Lat. *calendarium*, account-book, interest falling due on the calends, from *calendæ*, calends). The mode of adjusting the months and other divisions of the civil year to the natural or solar year. The necessity of some division and measurement of time must have been early felt. The phases or changes of the moon supplied a natural and very obvious mode of dividing and reckoning time, and hence the division into months (q.v.; see also **WEEK**) of 29 or 30 days was, perhaps, the earliest and most universal. But it would soon be observed that for many purposes the changes of the seasons were more serviceable as marks of division; and thus arose the division into years (q.v.), determined by the motions of the sun. It was soon, however, discovered that the year, or larger division, did not contain an exact number of the smaller divisions or months, and that an accommodation was necessary; and various not very dissimilar expedients were employed for correcting the error that arose. The ancient Egyptians

had a year determined by the changes of the seasons, without reference to the changes of the moon, and containing 365 days, divided into 12 months of 30 days each, with five supplementary days at the end of the year. The Jewish year consisted in the earliest periods, as it still does, of 12 lunar months, a thirteenth being from time to time introduced, to accommodate it to the sun and seasons. This was also the case with the ancient Syrians, Macedonians, etc. The Jewish months have alternately 29 and 30 days; the years are arranged in cycles of 19 years, seven of which, viz., the 3d, 6th, 8th, 11th, 14th, 17th, and 19th, have the intercalary month, and are known as "embolismic" years. Some of these years have one, and some two days more than others, so that the length of the year varies from 353 to 385 days. The beginning of the Jewish civil year falls between September 5 and October 5, and corresponds to the period of seedtime in Palestine. The names of the months in order are Tishri, Heshwan, Kislew, Tebet, Shebat, Adar, Nisan, Iyyar, Siwan, Tammuz, Ab, and Elul, the intercalary month, We-Adar, being inserted between Adar and Nisan. The seventh civil month, Nisan, which comes at the time of harvest in Palestine, is regarded as the first month of the Jewish sacred year. The Greeks, in the most ancient periods, reckoned according to real lunar months, 12 making a year; and about 594 B.C. Solon introduced in Athens the mode of reckoning alternately 30 and 29 days to the month, accommodating this civil year of 354 days to the solar year by occasional introduction of an intercalary month. A change was afterward made, by which three times in eight years a month of 30 days was intercalated, making the average length of the year $365\frac{1}{4}$ days. See METONIC CYCLE.

The Romans are said to have had originally a year of 10 months; but in the time of their kings they adopted a lunar year of 355 days, divided into 12 months, with an occasional intercalary month. Through the ignorance of the priests, who had the charge of this matter, the utmost confusion gradually arose, which Julius Cæsar remedied (46 B.C.) by the introduction of the Julian Calendar, according to which the year has ordinarily 365 days, and every fourth year is a leap year of 366 days—the length of the year being assumed as $365\frac{1}{4}$ days, while it is in reality 365 days, 5 hours, 48 minutes, and 46 seconds; or 11 minutes, 14 seconds less. See KALENDS; MONTH.

So perfect was the Julian style of reckoning that it prevailed generally among Christian nations, and remained undisturbed till the accumulation of the remaining error of 11 minutes or so had amounted, in 1582, to 10 complete days, the vernal equinox falling on the 11th instead of the 21st of March, as it did at the time of the Council of Nice, 325 A.D. This shifting of days had caused great disturbances, by unfixing the times of the celebration of Easter, and hence of all the other movable feasts, and accordingly, Pope Gregory XIII, after careful study, with the aid of Clavius, the astronomer, ordained that 10 days should be deducted from the year 1582, by calling what, according to the old calendar, would have been reckoned the 5th of October the 15th of October, 1582; and, in order that this displacement might not recur, it was further ordained that every hundredth year (1700, 1800, 1900, etc.) should not be counted a leap year, excepting every fourth hundredth, beginning

with 1600. In this way the difference between the civil and natural year will not amount to a day in 3000 years. In Spain, Portugal, and part of Italy, the Pope was exactly obeyed. In France the change took place in the same year, by calling the 10th the 20th of December. In the Low Countries the change was from the 15th December to the 25th; but it was resisted by the Protestant part of the community till the year 1700. The Catholic nations, in general, adopted the style ordained by their sovereign pontiff; but the Protestants were then too much inflamed against Catholicism in all its relations to receive even a purely scientific improvement from such hands. The Lutherans of Germany, Switzerland, and, as already mentioned, of the Low Countries, at length gave way in 1700, when it had become necessary to omit 11 instead of 10 days. A bill to this effect had been brought before the Parliament of England in 1585, but does not appear to have gone beyond a second reading in the House of Lords. It was not till 1751, and after great inconveniences had been experienced for nearly two centuries, from the differences of the reckoning, that an act was passed for equalizing the style in Great Britain and Ireland with that used in other countries of Europe. It was then enacted that 11 days should be omitted after the 2d of September, 1752, so that the ensuing day should be the 14th. A similar change was made about the same time in Sweden and Tuscany, and Russia and Greece are now the only countries using the old style; a practice which renders it necessary, when a letter is thence addressed to a person in another country, that the date should be given thus: April $\frac{1}{4}$ or June 27. It will be observed that the years 1800 and 1900, not being considered by us as leap years, have interjected two more days, making the difference 13 days between old and new style.

Mohammedan Calendar. The Mohammedan world employs a lunar year of 354 days, divided into 12 lunar months which have alternately 30 and 29 days. The names of the months are Muharram, Saphar, Rabia I, Rabia II, Jomada I, Jomada II, Rajab, Shaaban, Ramadan, Shawal, Dulkaada, and Dulheggia. Eleven times in every cycle of 30 years, an extra day is added at the end of the year, but no attempt is made to regulate the calendar to the solar year. Consequently there can be no correspondence between the months and the seasons, and the beginning of the year may fall at any time during the solar year. The Mohammedan year which began on Nov. 30, 1913, was the 12th year in the 45th cycle, or the year 1332 of the Mohammedan era. See CHRONOLOGY; HEJRA.

French Revolutionary Calendar. The French nation, in 1793, undertook the task of making a new calendar, professedly upon philosophical principles. The new era was dated from the minute of the autumnal equinox (Sept. 22, 1792), which was also the day from which the existence of the republic was reckoned (although the formal proclamation of the republic was on September 21). There were 12 months of 30 days each, divided into decades, in which the days were named numerically—Primidi, Duodi, and so on, up to Decadi. The remaining five days were grouped as festal days at the end of the year and known as *Sansculottides*. The months, seasons, and festivals were arranged as follows (the table being for the years I, II, III,

V, VI, VII, the dates varying by one or two days in the remaining years):

AUTUMN

Vendémiaire..... Vintage month... 22 Sept to 21 Oct.
Brumaire..... Fog month... 22 Oct. to 20 Nov.
Frimaire..... Sleet month... 21 Nov. to 20 Dec.

WINTER

Nivôse..... Snow month... 21 Dec. to 19 Jan.
Pluviôse..... Rain month... 20 Jan. to 18 Feb.
Ventôse..... Wind month... 19 Feb. to 20 Mar.

SPRING

Germinal..... Seed month... 21 Mar. to 19 April
Floréal..... Blossom month... 20 April to 19 May
Prairial..... Pasture month... 20 May to 18 June

SUMMER

Messidor..... Harvest month... 19 June to 18 July
Pervidor, or Thermidor... Heat month... 19 July to 17 Aug.
Fructidor..... Fruit month... 18 Aug. to 16 Sept.

SAINSCULOTTIDES, OR FEASTS DEDICATED TO

Les Vertus..... The Virtues..... 17 Sept.
Le Génie..... Genius..... 18 Sept.
Le Travail..... Labor..... 19 Sept.
L'Opinion..... Opinion..... 20 Sept.
Les Récompenses..... Rewards..... 21 Sept.

A sixth additional day in leap years was named *le jour de la Révolution*. This calendar was a product of the revolt against Christianity, and it existed until the old system was restored by Napoleon, Jan. 1, 1806.

Perpetual Calendar. An arrangement for ascertaining the day of the week corresponding to any desired date, and for solving other similar problems. The following form of perpetual calendar was arranged by Capt. J. Herschel and is probably the best yet devised. As here given, it covers the period from 1798 to 2000, but it can be extended easily in either direction.

Every date is composed of four elements, viz.:

- (1) Day of the week.
- (2) Day of the month.
- (3) Name of the month.
- (4) Number of the year.

Any three of these elements being given, we can find the fourth from the perpetual calendar. Thus, suppose we wish to find what day of the week corresponded to March 4, 1865, on which day Lincoln was inaugurated President of the United States for the second time. Entering the calendar in the column headed "March," and opposite the "day of the month" 4, we find the sign +. Now, entering the column containing the year 1865, and going up it to the same sign +, we find opposite that sign, on the right, the "day of the week" Saturday. Accordingly, Lincoln was inaugurated on a Saturday.

Again, suppose it is required to find in what years March 4 (inauguration day) can fall on a Sunday. As before, for March

PERPETUAL CALENDAR

DAY OF THE MONTH					Jan. Oct.	Apr. July Jan.	Sept. Dec.	June	Feb. Mar. Nov.	Aug. Feb.	May	
1	8	15	22	29	×	+	=	*	||	‡	§	Monday
2	9	16	23	30	§	×	+	=	*	||	‡	Tuesday
3	10	17	24	31	‡	§	×	+	=	*	||	Wednesday
4	11	18	25	32	||	‡	§	×	+	=	*	Thursday
5	12	19	26		*	||	‡	§	×	+	=	Friday
6	13	20	27		=	*	||	‡	§	×	+	Saturday
7	14	21	28		+	=	*	||	‡	§	×	Sunday
					1798	1799	1800	1801	1802	1803	<p>NOTE</p> <p>The <i>italic</i> months are for use in bissextile years only. No attention need be paid to leap years, unless the date falls in January or February.</p>
					1804	1805	1806	1807	....	1808	1809
					1810	1811	....	1812	1813	1814	1815
					....	1816	1817	1818	1819	....	1820
					1821	1822	1823	....	1824	1825	1826
					1827	....	1828	1829	1830	1831	....
					1832	1833	1834	1835	....	1836	1837
					1838	1839	....	1840	1841	1842	1843
					....	1844	1845	1846	1847	....	1848
					1849	1850	1851	....	1852	1853	1854
					1855	....	1856	1857	1858	1859	....
					1860	1861	1862	1863	....	1864	1865
					1866	1867	....	1868	1869	1870	1871
					....	1872	1873	1874	1875	....	1876
					1877	1878	1879	....	1880	1881	1882
					1883	....	1884	1885	1886	1887	....
					1888	1889	1890	1891	....	1892	1893
					1894	1895	....	1896	1897	1898	1899
					1900	1901	1902	1903	....	1904	1905
					1906	1907	....	1908	1909	1910	1911
					....	1912	1913	1914	1915	....	1916
					1917	1918	1919	....	1920	1921	1922
					1923	....	1924	1925	1926	1927	....
					1928	1929	1930	1931	....	1932	1933
					1934	1935	....	1936	1937	1938	1939
					....	1940	1941	1942	1943	....	1944
					1945	1946	1947	....	1948	1949	1950
					1951	....	1952	1953	1954	1955	....
					1956	1957	1958	1959	....	1960	1961
					1962	1963	....	1964	1965	1966	1967
					....	1968	1969	1970	1971	....	1972
					1973	1974	1975	....	1976	1977	1978
					1979	....	1980	1981	1982	1983	....
					1984	1985	1986	1987	....	1988	1989
					1990	1991	....	1992	1993	1994	1995
					....	1996	1997	1998	1999	....	2000

4 we find the sign †. Opposite Sunday we find that sign in the first column of years, beginning with 1798, 1804, etc. In all the years in this column, therefore, March 4 will fall on a Sunday. But presidential inaugurations usually occur only in years following leap years, which latter are indicated by *italics* in the perpetual calendar. Consequently, Sunday inaugurations occurred in 1821, 1849, 1877, and will occur in 1917, 1945, 1973.

Primitive Calendar. Among Amerind tribes, inchoate writing in the form of a rude inscription, sometimes called "winter count," recording notable events in the life of an individual or the history of a tribe. The woodland tribes made the inscriptions on trees or on birch bark; dressed skins were used by the tribes of the prairies; some of the tribes of the arid regions (e.g., the Prina) incised rude mnemonic symbols on canes or wands; while in Mexico and Yucatan calendric inscriptions of related character, although recorded in more or less arbitrary glyphs, rather than rude ideographs or ikonographs, were preserved in scrolls or books of maguëy paper.

Consult Burnaby, *Elements of the Jewish and Muhammedan Calendar* (London, 1901); Plunket, *Ancient Calendars and Constellations* (London, 1903); Mahler, *Etudes sur le calendrier égyptien* (Paris, 1907); Schram, *Kalendariographische und chronologische Tafeln* (Leipzig, 1908); Boll, *Griechische Kalender* (Heidelberg, 1910); Bowditch, *Numeration, Calendar Systems and Astronomical Knowledge of the Mayas* (Cambridge, Mass., 1910); Langdon, *Tablets from the Archives of Draham, with a Complete Account of the Origin of the Sumerian Calendar* (Paris, 1911). See ARCHAEOLOGY, AMERICAN; MAN, SCIENCE OF.

CALENDAR. In law, an official list or schedule of cases, arranged in the order in which they are to be taken up and disposed of.

Court Calendar. The official list of causes pending in a court for trial or argument. It generally contains the names of the parties and of their attorneys, as well as the date and nature of the issue, i.e., whether of fact or of law. Ordinarily, the causes are entered in the order of their date of issue (q.v.), the first one being that in which issue has been joined the longest; but the statutes and court rules give precedence to some cases over others. Certain actions brought by the United States or by a State may be advanced and tried out of their chronological order. Criminal cases are entitled to a preference over civil suits, and among criminal cases capital offenses have precedence over others. In English legal procedure such a calendar of cases is known as a Cause List.

Calendar of Prisoners. In England, a sheriff's certified list of all prisoners in his custody awaiting trial for felony, prepared for a court sitting under a commission of jail delivery (q.v.). Recent legislation has transferred this duty from sheriffs to gaolers and keepers of prisons in which persons awaiting trial are confined. In the United States similar lists are often required, either of the sheriff or of the keeper of a prison.

CALENDERING (Fr. *calandre*, roller, from Lat. *cylindrus*, Gk. *κύλινδρος*, *kylindros*, cylinder, roller). The term applied to the finishing process by which a glazed or polished surface is given to paper and various textile fabrics, such as linen and cotton. It is usually done by pass-

ing the fabric between cylinders or rolls under pressure; hence the origin of the term, which is a corruption of cylindering. The familiar domestic process of starching and ironing illustrates in a simple form the object and result of calendering, and the common domestic mangle is a near approach in a simple form of the large calendering machines used in paper and textile manufacture. These machines consist of a series of from 3 to 12 rolls or "bowls" set one above the other in a strong iron frame and so arranged that heavy pressures can be brought to bear on the rolls, and therefore on the fabric which is passed between them. The rolls were formerly made of wood, but this material proved unsatisfactory because it warped. At present, when metal rolls are not used, the rolls are made of paper or cotton rendered solid by hydraulic pressure. Metal rolls are made of steel, chilled cast-iron, or brass, and are often made hollow, to allow them to be heated internally where hot calendering is required. The process of calendering consists in passing the fabric between the rolls a number of times, depending upon the material and the finish required. Often cloths are starched before being calendered, and for a highly glazed surface a little paraffin or soap may be added. To impart a glaze or polish one of the pair of rolls is made to revolve faster than the other, which causes it to slide on the fabric, with exactly the same effect as results from the sliding back and forth of the flatiron in "ironing" or polishing the domestic linen. Sometimes the surfaces of the rolls have slightly raised patterns which produce the effect known as watering. In making the rolls for calendering the utmost accuracy of workmanship is exercised to secure a truly cylindrical surface; metal rolls are turned on a lathe, then ground and finally polished. Great care has also to be taken in setting the rolls in the frame and in adjusting them to each other. The method of applying the pressure is by using weights or by hydraulic presses, or by means of screws. Consult Beaumont, *The Finishing of Textile Fabrics* (London, 1909); Edge, *Practical Cotton Finishing* (London, 1911). See BEETLING; PAPER.

CALENDS. See KALENDS.

CALENTES AQUÆ. See CHAUDESAIGUES.

CALENTURA, *kä'län-tō'rä* (Sp., from Lat. *calere*, to glow, to be hot). A medical term formerly applied to a tropical fever with acute delirium, never fully described, but supposed to attack sailors in hot climates. The word was revived during the Spanish-American War, and applied to a fever prevalent in Cuba and the Philippine Islands; also called Cuban fever. It is said to begin without prodromal symptoms, a chill and a temperature of 103° F. ushering in the disease. The temperature is likely to rise higher; muscular pains supervene, with headache, loss of appetite, nausea, and marked weakness. Many cases recover spontaneously in a week. Calomel, followed by a saline cathartic, is given with success. Quinine is said to possess no efficacy.

CALEPINO, *kä'lä-pé'nó*, AMBROGIO (1435-1511). An Italian lexicographer, born at Capelio, Bergamo. He was an Augustinian monk, and devoted his entire life until he became blind to the making of a polyglot dictionary (1502); the vocabulary being Latin and the explanations or definitions in seven languages. The Aldi published 18 editions of it in a half-

century (1542-92). That of 1590 comprises 11 languages. A revision undertaken in the eighteenth century resulted in the great *Totius Latinitatis Lexicon* (1771) of Forcellini and Facciolati (qq.v.).

CALGARY. The largest city in the Province of Alberta, Canada, situated on the Bow River, and on the main line of the Canadian Pacific Railway, 2262 miles west of Montreal and 860 miles west of Winnipeg (Map: Alberta, F 7). Branch lines of the Canadian Pacific running north and south connect it with Edmonton, the capital of the province, and with Lethbridge and the Kootenay district to the south. It is the centre of a large stock-raising region, and the chief supply station of mining districts in the Rocky Mountains and British Columbia. It is also the chief distributing point between Winnipeg and the Pacific coast, its geographical position enabling expeditious handling. Large shipments of cattle, horses, and wheat are regularly made, and a notable auction sale of cattle is annually held. Calgary is one of the chief stations of the Royal Northwest Mounted Police. It is within easy distance of several famous mountain resorts and attracts large numbers of tourists. The city is laid out in rectangular form, with wide streets, whose buildings are chiefly of a fine quality of stone found in the vicinity. The educational facilities are excellent. The University of Calgary was organized in 1913. There are also Mount Royal College (Methodist), a Roman Catholic convent, 28 high and public schools, and three Roman Catholic separate schools. There are over 50 churches, some of them of fine architectural design; and the civic buildings are handsome and well constructed. Calgary is a divisional point on the Canadian Pacific Railway, and contains large repair shops costing over \$3,000,000 with an estimated pay roll of nearly \$2,000,000. It is an important milling centre, and the output of its manufacturing industries includes biscuits, boxes, cereal foods, bricks, beds, building materials, confectionery, cigars, cement, cement blocks, ground coffee and spice, electric light and power, gas, harness, iron and metal works, lumber, leather goods, mattresses, meat products, soap, show cases, tools, carriages and wagons, aerated waters, beer, etc. The value of the manufactured products for 1910 was \$7,751,011 as compared with \$599,444 in 1900 and \$258,900 in 1890. In the neighborhood are extensive coal beds (lignite, bituminous, and anthracite), lime, brick, clay, and building stone. Electric power for manufacturing purposes is developed on Bow River, west of the city, and natural gas is supplied from Bow Island, 100 miles distant. The city owns its electric street railway, water works (gravity system), a complete sewage system, and an asphalt plant. It was founded in 1883 and incorporated as a city in 1894. Pop., 1901, 4392; 1911, 43,704; local directory estimate (1913), 89,935.

CALHOUN, kál-hōon', JOHN CALDWELL (1782-1850). A distinguished American statesman, born in Abbeville District, S. C., on March 18, 1782; of Scotch-Irish descent, the third son of Patrick Calhoun, his mother having been before marriage Martha Caldwell. Calhoun early showed that he possessed a thoughtful turn of mind, and, though he had little teaching when a boy, he began to study law at the age of 18, supplementing this with other reading which enabled him to enter the junior class at Yale

College in 1802. While at college he was known as a hard student, especially of political and historical subjects, and graduated in 1804 with high honors. He then resumed the study of law, in Litchfield, Conn., and in a law office in Charleston, and was admitted to the bar in 1807, beginning practice at Abbeville, S. C. In 1808 he was sent to the State Legislature, where he attracted so much attention as to secure an election to Congress in 1811. In the same year he married his cousin, Floride Calhoun, who had a moderate fortune, and this enabled him to pursue for a time an independent course in national politics. During this period Calhoun took a broader view of the American Constitution than that with which his name is now identified. American political parties were then in a transition period; and Calhoun, chafing at the arrogance of Great Britain, ranged himself with Henry Clay (q.v.) and favored a warlike policy, so that he and Clay were popularly known as "the War Hawks." His intense personality, when joined with Clay's magnetic qualities, forced Madison's administration into a declaration of war on Great Britain, and throughout that war he both spoke and voted for its vigorous prosecution. Later, in 1816, he favored the establishment of a national bank, an increase of the navy, extensive internal improvements at the national cost, especially in providing great highways with the express purpose of uniting more closely all the members of the American Republic. He even advocated a protective tariff. All this was wholly inconsistent with his later views of strict construction and separatism; but it showed him at that period of his career to have had a wise and far-seeing conception of national unity.

In March 1817, Calhoun was appointed Secretary of War by President Monroe. The War of 1812 had left the department in great disorder. This gave Calhoun an opportunity of showing his admirable qualities as an administrator, and he soon established system in place of chaos. He prepared, for submission to the House, extremely able reports on the subject of highways and canals and on Indian affairs. Although the army was reduced from 10,000 to 6000 men, it was made more efficient than it had ever been before, and Calhoun insisted upon expenditures that were almost lavish, but that showed his conception of an effective military establishment. Furthermore, during his tenure of this office every cent was honestly expended, and not a single defalcation occurred. When he retired from the secretaryship, his chief subordinates in an address (1825) said: "The degree of perfection to which you have carried the several branches of this department is believed to be without parallel"; and Joseph Story had already written (1823): "I have great admiration for Mr. Calhoun, and think few men have more large and liberal views of the true policy of the national government." He conceded the right of the United States to regulate slavery in the territories at the time of the Missouri Compromise of 1820 (q.v.), indicating a spirit of Nationalism which he retained up to the tariff agitation of 1827. In 1824 Calhoun received 182 electoral votes for Vice President as against 79 scattering ballots, and was elected. No one having a majority of votes for the presidency, the election devolved upon the House of Representatives, and John Quincy Adams was made President. In 1828 Calhoun was reelected

under Jackson as President, and now became an extreme advocate of States' rights, because a protective tariff had been passed, some of whose features were injurious to the agricultural interests of South Carolina. This so-called "Tariff of Abominations" led to the preparation by Calhoun of an elaborate document setting forth the principle of State sovereignty in an extreme form. This was approved and issued by the Legislature of South Carolina and is known as "The South Carolina Exposition." Three years later his doctrine was expanded to include the theory that each State had the right to nullify any United States law which the State might regard as unconstitutional. Calhoun had already broken off all personal relations with President Jackson, who regarded him as treacherous both to himself and to the country. A policy of pin pricks widened the breach between Jackson and Calhoun, and their personal animosity was intensified by the notorious Eaton affair. (See EATON, MARGARET.) From this time Calhoun's chance for election to the presidency was extinguished, since Jackson, "the Hero of New Orleans," so dominated the nation as to enable him to choose his successor in the person of Martin Van Buren (q.v.).

On Aug. 28, 1832, Calhoun wrote to Governor Hamilton of South Carolina a final statement of the theory of nullification (q.v.) in these words: "There is no direct and immediate connection between the individual citizens of a State and the general government," adding somewhat paradoxically that nullification is the great conservative principle of union. President Jackson with characteristic grimness threatened to hang Calhoun and at a public banquet uttered the memorable words: "The Union must and shall be preserved." When another South Carolina convention, on Nov. 24, 1832, passed an ordinance nullifying the tariff, Calhoun immediately resigned the vice presidency and entered the Senate. By a compromise, arranged by Clay, an armed conflict was avoided. South Carolina won the particular point as to the tariff, but failed to secure the establishment of nullification as a principle. Acting with the Whigs, but still independent, Calhoun now became a scathing critic of Jackson's administration, though suppressing in his public utterances any personal animus. He condemned severely Jackson's removal of the government deposits from the United States Bank and his development of the spoils system. Foreseeing more clearly than any one else the conflict between the North and the South on the slavery question, he sought to avert it by checking all discussion of the issue. When, after the financial crisis of 1837, Van Buren proposed the so-called subtreasury scheme, by which the United States should avoid all connection with banks and should control its own deposits, Calhoun supported the President, much to the chagrin of the Whigs, with whom he had been acting. He was in favor of Van Buren's reelection and secured for him the vote of South Carolina. When Tyler, who became President on the death of William H. Harrison, vetoed the bill for rechartering the United States Bank, Calhoun defended him. He denounced the tariff of 1842 and supported the Webster-Ashburton Treaty (q.v.). After having declined reelection to the Senate in 1843, he was, in March of the next year, through a clever move on the part of Henry A. Wise, appointed Secretary of State by

Tyler and was chiefly instrumental in bringing about the annexation of Texas in order to extend slave territory, thus practically necessitating the Mexican War, which he strove later to avert. In 1845 he was again elected to the Senate. In order to check the antislavery movement at the North he proposed in 1847 a convention of Southern States to prevent Northern commerce from entering their ports. Slavery he had come to advocate as a positive good. In 1849 he proposed a Southern convention to set forth the grievances of the slave States, looking towards "dissolving the partnership," if the only course left open seemed submission. His last speech in connection with the Compromise of 1850 was read, on account of his weakness, by another Senator. In this he asserted that an amendment to the Constitution would be necessary to restore a proper political equilibrium. He died on March 31, 1850, having spent his last few months in writing his "Disquisition on Government," and his "Discourse on the Constitution and Government of the United States," probably the most remarkable discussion ever written on the rights of minorities.

Calhoun's personality was attractive, and his morals were irreproachable. His power of logical analysis seems to entitle him to rank as one of the most original of American political theorists. He was probably too much of a political theorist and philosopher to be regarded as a statesman of the first order. It must be conceded, however, that throughout his long political career he impressed both friends and foes as none but a man of extraordinary powers can do, and it is quite clear that he believed that the only way to preserve the Union was to reduce its strength almost to the vanishing point.

Bibliography. Consult: the *Life* by Jenkins (1851) and that by Von Holst (1882); Benton, *Thirty Years' View* (1854); Calhoun's *Collected Works* (6 vols., 1853-55); his correspondence, ed. by J. F. Jameson (1900); H. C. Peck, *The Jacksonian Epoch* (1906); Hunt, *J. C. Calhoun* (Philadelphia, 1908); H. T. Peck, *American Party Leaders* (New York, 1914); Dodd, *Statesmen of the Old South* (New York, 1911). See also CLAY, HENRY; HAYNE, ROBERT YOUNG; JACKSON, ANDREW; WEBSTER, DANIEL.

CALHOUN, kál-hoon', SIMON HOWARD (1804-76). An American Congregational missionary. He was born in Boston, graduated from Williams College in 1829, and in 1836 went as missionary to the Levant and later to Syria, where he labored till 1874. He was an authority on Arabic and Turkish, and worked on the first Turkish translation of the Bible with William Goodell (q.v.).

CALHOUN, WILLIAM JAMES (1848-1916). An American diplomat, born in Pittsburgh, Pa. He studied law, was admitted to the bar in 1875 at Danville, Ill., and in that city practiced until 1898. Two years later he removed to Chicago, becoming senior member of the law firm of Calhoun, Lyford & Shean. In 1897 he was appointed by President McKinley special commissioner to Cuba and in the year following a member of the Interstate Commerce Commission, in which position he served for two years. He was special commissioner for President Roosevelt to Venezuela in 1905, and, being appointed (1909) Minister to China, served at this post until the spring of 1913. In May of that year he attracted some attention by

severely criticising the Chinese policy of President Wilson.

CALÍ, ká-lé'. A city of Colombia, in the Department of Cauca (Map: Colombia, B 3). It is situated on the Calí, near its junction with the Río Cauca, 3100 feet above sea level, and contains the fine Ionic church of San Francisco and a college. A noteworthy bridge crosses the Río Calí at this point. The city is of considerable commercial and industrial importance, and is well equipped with business facilities: bank, telegraph, government post office, United States consular agent, etc. Calí was founded in 1536 by Sebastián de Belalcázar, and obtained its coat of arms in 1559. Pop., in 1912 (est.), 27,746.

CALÍBAN. 1. A deformed monster in Shakespeare's *Tempest*. He is the son of the witch Sycorax and a devil, and originally laid claim to the sovereignty of the enchanted isle. Prospero soon obtained complete mastery over his small mind, however, and has made a servant of him at the beginning of the play.

2. A cynical philosophic drama by Ernest Renan (q.v.), published in 1878. It professes to take up the story of Caliban from where he is left in Shakespeare's *Tempest*.

3. The nom de plume of Emile Bergerat.

CALIBAN UPON SETEBOS, or NATURAL THEOLOGY ON THE ISLAND. A characteristic psychological poem by Robert Browning. In it Shakespeare's amorphous creature, Caliban, discourses "touching that other, whom his dam called God." The text, "Thou thoughtest that I was altogether such a one as thyself," is a subtly ironical comment on the savage's words.

CALIBO, ká-lé'bó. A town of Panay, Philippines, in the Province of Capiz, situated on the north coast of the island, 40 miles west of Capiz. Pop., 1903, 14,574.

CALIBRE (Fr., perhaps from Lat. abl. sing. *qua libra*, of what weight, measure). The calibre of a smoothbore gun is the diameter of the bore. The calibre of a modern rifle of ordinary type is the diameter of a cylinder which will just touch the highest points of all the *lands* (the part of the surface of the bore between the grooves). In the case of rib-rifled guns, which have relatively very narrow lands, the calibre is the diameter of a cylinder which would just touch the bottom of all the grooves. The old smoothbore cannon were designated by the weight of the shot they threw, as 24-pounder, 68-pounder, etc.; modern rifled cannon are described by the calibre, such as 10-inch, etc. The length of a piece is now designated by the number of calibres; for example, a 12-inch gun 40 calibres long is 40 feet in length, etc. In small arms, in the United States and Great Britain, calibre is expressed in decimals of an inch, thus, .30 cal. is the customary way of expressing a diameter of 30/100 of an inch. In other European countries the calibre of small arms is stated in millimeters. See ARTILLERY; GUNS, NAVAL; ORDNANCE; PROJECTILES; SMALL ARMS.

CALIBURN. Another name of King Arthur's sword Excalibur.

CALICOBACK, or CALICO BIRD. See TURNSTONE.

CALICO BASS (possibly so called because of its variegated color). A sunfish-like, mottled-olive bass (*Pomoxis sparoides*) of the whole Mississippi valley and Great Lakes, highly prized as a food fish and as game for youthful anglers. It reaches a length of 12 inches,

weighing 2 pounds, haunts grassy streams and ponds, and bears transplanting well. It is a near relative of the crappie (q.v.) and is also known as grass bass, strawberry bass, and barfish. For illustration, see Plate of BASS, AMERICAN FRESH WATER.

CALICO BUSH. See KALMIA.

CALICO PRINTING. See TEXTILE PRINTING.

CALICUT (Hind. *kolikodu, kolikotta*). A seaport of the Malabar District, British India, in lat. 11° 15' N. and long. 75° 47' E., 566 miles south-southeast of Bombay, on the Indian Ocean and at the terminus of the southwest branch of the Madras Railway (Map: India, C 6). It was the first spot in India visited by the Portuguese trader, Covilham (1486), and it was here that Vasco da Gama reached the shores of India in 1498, having come by the way of the Cape of Good Hope. Calicut was at that time prosperous and powerful. The natives twice repulsed the Portuguese in 1500, slaying their commander in 1509. The city stands near the mouth of a small river of the same name and possessed at one time a good haven. Now its anchorage is merely an open roadstead. Aside from this physical disadvantage, the ravages of war and the competition of superior localities contributed to its decay. In 1702, when it fell into the hands of the English, the city was little better than a ruin, Hyder Ali, in 1765, having laid it waste to chastise European cupidity. Since then it has made considerable progress. Pop., 1891, 66,078; 1901, 76,981; 1911, 78,417. From Calicut, *calico* derived its name, although the manufacture of that article has now declined. It has an important export trade in timber, spices, cotton yarns, coffee, oil, and tiles.

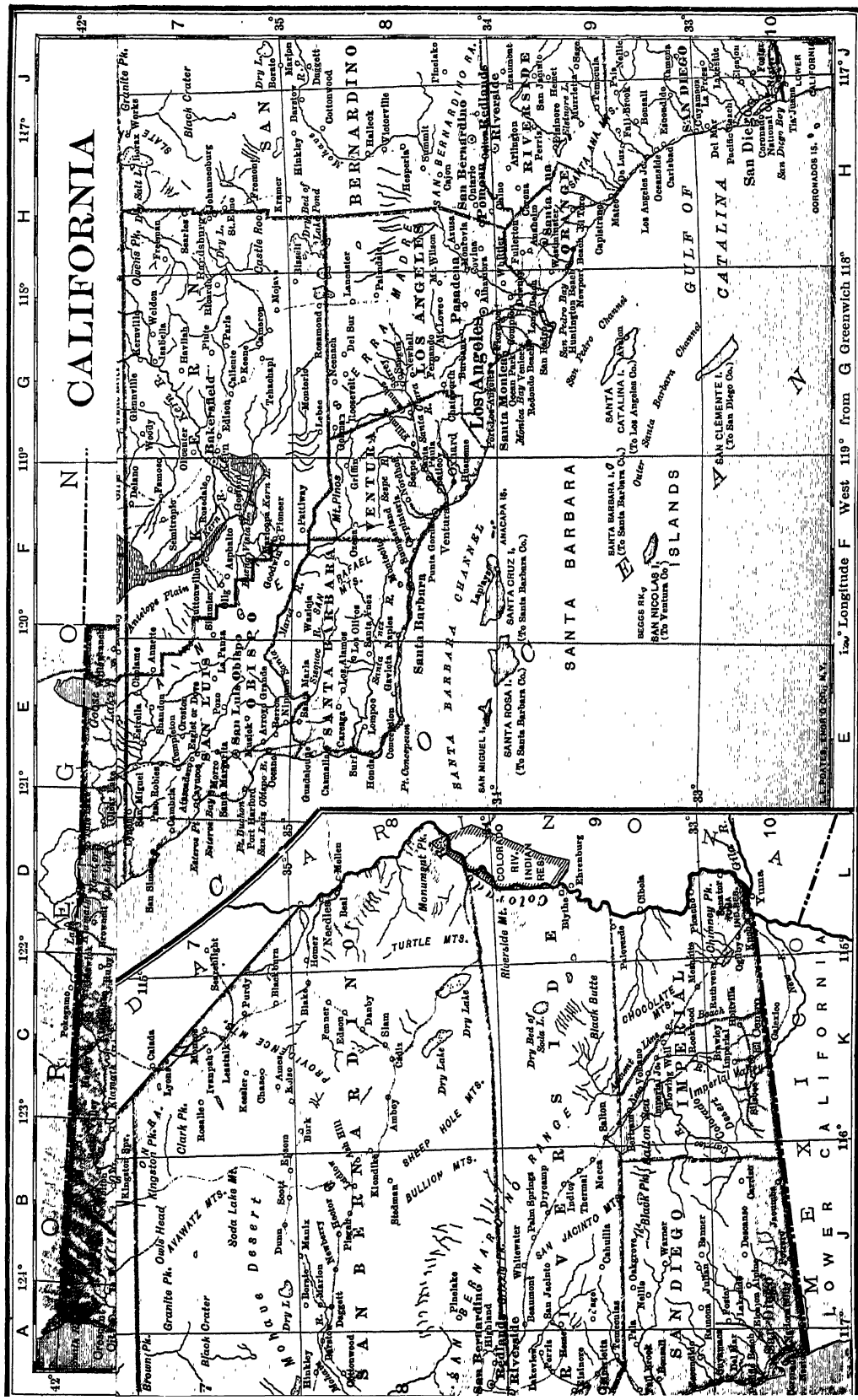
CALIDARIUM, or CALDARIUM. See BATH, Rome.

CALID'IUS, MARCUS (?-48 B.C.). A Roman orator, contemporary with Cicero, whose recall from exile he advocated. He was prætor in 57 B.C. and about 49 B.C. was made Governor of Cisalpine Gaul. He died at Placentia in 48 B.C. His oratory is praised by Cicero (*Brutus*, chap. 79-80). For the fragments of his orations, consult Meyer, *Fragmenta Oratorum Romanorum* (2d ed., Zurich, 1842). Consult also Quintilian (10, 1, 23, and 12, 10, 11).

CALIF DE BAGDAD, ká'léf' de bag'dád', LE. See BOELDIEU, F. A.

CALIFORNIA. A city and the county seat of Moniteau Co., Mo., 150 miles west of St. Louis, on the Missouri Pacific Railroad (Map: Missouri, D 3). It manufactures harness and saddlery, woolen goods, carriages, and wagons, men's clothing, flour, and pottery. California was settled about 1845, and is governed as a city of the fourth class. There are municipal water works and sewage system. Pop., 1900, 2181; 1910, 2154.

CALIFORNIA (it is fairly well established that the name was taken from Montaloo's romance *Las Sergas de Esplanadian*, but is supposed by some to be a contraction of Sp. *caliente forno*, or 'hot furnace,' applied by the early navigators to the southern sections of the State). A Pacific State of the United States of America, consisting of 58 counties and ranking second in area (not reckoning the Territory of Alaska), twelfth in population, and eighteenth in order of admission, and popularly known as the "Golden State" (Map: United States, Western part, E 2; also special map with article). Its capital is



CALIFORNIA

130° Longitude F West 119° from G Greenwich 118°

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Sacramento; pop., 44,696. The principal cities are San Francisco, 416,912; Los Angeles, 319,198; Oakland, 150,174. The State is bounded on the north by Oregon, on the east by Nevada and a small portion of Arizona, on the south by Lower California (Mexico), and on the west by the Pacific Ocean. It stretches along the coast from lat. 32° 40' N. to lat. 42°—a distance, measured along the centre of the State, of 750 miles—and its eastern boundary conforms to the curve of the seacoast, so that its breadth is approximately the same throughout, averaging about 200 miles. The meridian of 120° W. long. marks the eastern boundary of the northern third of the State and bisects the eastward-trending southern part, dividing the whole into two nearly equal parts. The total land area is 155,652 square miles. The population of the State is 2,377,549, according to the census of 1910.

Topography. The physiography of this immense State is strikingly varied, but, broadly stated, consists of two parallel mountain systems, extending northwest and southeast, inclosing between them a very extensive valley, in addition to which is included in the east a part of the Great Basin. Of the two mountain systems the longer is that known collectively as the Coast Range, being a part of the uplift extending from the extremity of Lower California to the edge of Oregon and reappearing in the Olympic Range of Washington, the islands of British Columbia and southern Alaska. Within the limits of California, beginning at the south, it is made up of the San Jacinto, Santa Ana, San Bernardino, and San Gabriel ranges, then of the San Rafael and Santa Lucia mountains along the lofty coast between Los Angeles and Santa Cruz. East of these ranges is a second lesser range, called by the Mexican settlers Sierra Madre, which becomes more prominent northward and extends thence to the border of Oregon, where the watershed bends eastward and forms the very lofty Shasta and Salmon River ranges; but Shasta belongs orographically to the Cascade system of Oregon. Notable altitudes in this system are as follows: San Bernardino Mountain, 10,630 feet; San Jacinto Peak, 10,805 feet; San Gabriel Peak, 6152 feet; Tehachapi Mountain, 9214 feet; Pinos Mountain, 9214 feet; Monte Diablo, 3849 feet; Thunder Mountain, 9121 feet; Eddy Mountain, 9161 feet; Mount Scott, 7850 feet. The altitude of Mount Shasta, a volcanic mass in Siskiyou County, in the extreme northern part of the State, is 14,380 feet.

East of the coast ranges, and parallel with them, lies the Sierra Nevada ('Snowy Range'), at a distance of 100 to 140 miles, stretching from the 36th parallel northwestward nearly to the 41st, where it ends at the valley of Pitt River, which separates it from the Shasta Range. This system consists of a massive uplift of sedimentary and igneous rocks, which have been worn into an area of clustered peaks, averaging 50 miles wide and over 400 miles long. The eastern side is abrupt and rises from the plateau of Nevada, but the western slope, receiving nearly all the rainfall and delivering all the drainage, has been worn into a series of tremendous cañons, of which those of the Merced (Yosemite), Kings, Tuolumne, and American rivers are far-famed. The Sierra Nevada is characterized by its ruggedness and by the great average altitude of its central mass. The principal peaks and their measurements are as follows, beginning with the highest mountain

in the United States proper: Mount Whitney, 14,502 feet; Fisherman Peak, 14,448 feet; Mount Corcoran, 14,093 feet; Kaweah Peak, 13,752 feet; Mount Brewer, 13,886 feet; Mount Lyell, 13,090 feet; Merced Peak, 11,722 feet; Gray Peak, 11,518 feet; Dunderberg Peak, 12,320 feet; Twin Peak, 8924 feet; Mount Matterhorn, 12,260 feet; Tower Peak, 11,704 feet; Leavitt Peak, 11,575 feet; Sonora Peak, 11,429 feet; Stanislaus Peak, 11,202 feet; Pyramid Peak, 10,020 feet. In the northeastern corner of the State there runs straight northward along the Nevada boundary a line of elevations of igneous origin, called the Warner Range. West of this line of peaks a plateau formed by a lava overflow and averaging 5000 feet above the sea, stretches to the Shasta and Siskiyou mountains and northward into the Klamath region of Oregon.

Between these two mountain systems, the Coast Range and the Sierra Nevada, lies the great valley of California, broadly open for some 400 miles from where the Kern River Mountains connect the Sierra Nevada with the Coast Range at Tehachapi, to where Shasta closes it in the far north. This valley is divisible into three parts. The first is the basin of the Sacramento River, north of San Francisco Bay, into which the river empties. This stream is considered by some to begin as the Pitt River, which flows out of Goose Lake, in the northern part of the State, forces its way through the gorges that separate the Sierra Nevada from the Shasta Range, and turns southward into the Sacramento River. It is fed by many streams from the mountains on each side, of which the Indian, Feather, and American are largest, and in its lower course traverses a flood plain which is marshy in places annually overflowed. South of where the river turns into the sea and expands into Suisun and San Pablo bays, the valley is occupied by another large river, the San Joaquin, which gathers its waters in the heights of Fresno County. It is also swelled by the Merced, the La Grange, Stanislaus, Calaveras, Consumnes, and lesser streams, which periodically pour their floods down the valley. South of the head of the San Joaquin valley, and separated from it at Fresno by a low divide, begins a dry and fairly level plain, about 100 miles long by 80 broad, the western part of which is a low, alkaline desert, surrounding Tulare Lake—an expanse of marsh-girt waters, 25 miles broad. Into this basin pours Kings River, and towards it flow many other mountain streams, which mostly disappear in the sand. In the southern part of this valley plain the Kern River flows southwestward through a region some 500 feet above sea level and empties into Buena Vista Lake. South and east of the mountains the country becomes a hot and waterless waste, named Mohave and Colorado deserts, sloping gradually to the Río Colorado and the Gulf of California. In the northern half this waste is broken by ranges and groups of arid, volcanic hills, among which lie deep salt-covered valleys, the most forbidding of which is Death Valley (q.v.), a depression near the Nevada boundary and just north of the 36th parallel. The valley is from 200 to 350 feet below sea level. On the seaward side of the Sierra Madre, however, is an extensive region, narrowing northward to Santa Barbara, comprising the most populous part of southern California—the districts about San Diego, Los Angeles, Riverside, Ventura, and Santa Barbara. **Coast districts**

are repeated northward in Monterey and Santa Clara counties, and north of San Francisco Bay, in Sonoma and Mendocino counties, west of the Coast Range. Some important rivers descend to the sea in these coastal regions, such as Russian River, in Sonoma County; Eel River, in Mendocino and Humboldt counties; and Trinity River, in Trinity County, most of which have a northwest course. Flowing irregularly southwest across the northwest corner of the State is the Klamath River, which drains the Siskiyou, Salmon, and other coast ranges of that region.

The coast south of Santa Barbara is a plain, stretches of which are sandy. It has several large islands in the offing. But north of Santa Barbara it is high and rocky, bold cliffs facing the sea, almost unbroken by harbors, other than that of the Bay of San Francisco, entered through the rift in the coast, cut by the joint outflowing of the Sacramento and San Joaquin rivers, and called the Golden Gate.

Climate. No State of the United States—indeed, few of the most favored countries of the world—can boast of so delightful a climate as that of the valley lands of California. Low wind velocities and high percentage of sunshine are striking features. Two seasons, the wet and the dry, divide the year—the first, so called because it is the only period during which it rains, though rains are not continuous, and the average fall for the State, 23 inches, is less than at Chicago or St. Louis. Within the State relief causes a wide range in the amount of rainfall in different sections. It amounts to more than 75 inches annually on the windward slopes of the Sierras. Precipitation is light in the Great Valley and east of the Sierra Nevadas, often not exceeding 3 inches a year. The wet season lasts from about the middle of November till April or May.

At San Francisco snow is almost unknown, the mercury never remains below the freezing point for 24 hours, and flowers bloom in the gardens at Christmas time. The average mean temperature at San Francisco is 51°—summer, 60°; winter, 49°. The California coast is subject to trade winds from the southwest. Its climate is therefore mild and temperate and recalls Mediterranean conditions far better than the Gulf of Mexico, which is tropical and to which the name of the American Mediterranean is inaccurately applied. Owing to the cool summer climate of the coast between parallels 35 and 40, San Francisco in July is cooler than San Diego by 7°, and than New York by 17°. Its highest temperature is felt only when the trade winds cease in September.

In the inland valleys greater extremes of temperature are experienced than along the coast. The mean temperature for this belt is 64°. It varies little. In the north the summer is warmer and the winter cooler than in the south. The rainfall decreases gradually from north to south, being 51 inches at Cape Mendocino and 46.6 inches at Redding, in the interior, on the same parallel as Cape Mendocino, 23 inches at San Francisco and 7 inches at Bakersfield. In general the northern coast mountains receive an abundant supply of rainfall. These regions are therefore well forested, and lumbering is carried on extensively. In southern California the climate almost reaches perfection. At San Diego the mean winter temperature is 54°, summer, 68°, and at Santa Barbara, 53° and 68° respectively. At Mon-

terey the difference between the average temperature of January and July is 6°; at Los Angeles, 12°. San Diego is 6° or 7° cooler than Charleston and Vicksburg, which are nearly in the same latitude. The great heat of the interior and of the southwest, where, as at Fort Yuma, the average summer temperature is 92°, is due to the dryness, which is easily borne, and sunstrokes never occur. The rainfall over a large area in the southern desert of the State is less than 5 inches annually. Cyclonic storms occur at the approach of winter in California. Everywhere the nights are cool. Early spring, comprising the latter part of February through April, is the most delightful part of the year. The air is mild, the sky clear, and the landscape gay with flowers. Summers are dry even along the coast from 6 to 10 miles inland, where fogs are likely to occur. During the summer the earth becomes dried to a depth of several inches; the air is filled with dust, and the smaller streams disappear—a state of things that lasts until the autumn rains begin. Among prominent winter resorts are San Diego, noted for its fine harbor, on one side of which is the famous Coronado Beach; Santa Barbara, overlooking the Pacific, a favorite watering place; Santa Monica, noted for surf bathing throughout the year; Santa Cruz, with a fine beach and background of mountains; Monterey, on beautiful Monterey Bay, associated with the earlier history of the province under Spanish rule; Indio, over 100 feet below sea level, remarkable for cures effected by its air in pulmonary diseases; Los Angeles and adjoining places, including Pasadena, in a section that has been termed "the Italy" of the United States—a paradise of rose gardens, vineyards, and lemon and orange groves. Among other well-known resorts are the Arrowhead Hot Springs, Paso Roble, and Napa Soda Springs.

Climate, in California as elsewhere, is the most important factor in agricultural industries. Irrigation has to be resorted to in some sections because of light precipitation on the lowlands, except in the case of grain crops, deciduous fruits, and grapes. The irrigated farms are generally small. Dry weather in summer enables the grain crop to be harvested without loss. The absence of severe storms to damage the crop after it has been cut is an advantage. The citrus-fruit industry, which is valued at over \$20,000,000 annually, is restricted to areas having very mild winter temperatures. Oranges are grown as far north as Butte County. Several industries are due to the high temperatures on the Colorado Desert in southeastern California. A splendid farming country occupies the reclaimed areas of the Imperial valley. Long-staple cotton is grown here with success. Date culture has been taken up at Indio and Mecca.

Flora. As California presents almost every variation of temperate climate, it naturally presents a very wide variation in its flora. The influence of climate upon flora is nowhere more strongly marked than in this State. The tree flora of California, as of the entire western part of the country, consists largely of coniferae, while broad-leaved trees are less abundant and consist of oaks, sycamores, California laurel, madroña, and a few other species. Over 20,000,000 acres of forest land are available for the lumber industry. The trees of all species are of great size. For illustration, see SEQUOIA.

CALIFORNIA FLORA



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1 GILIA - *GILIA TRICOLOR*

2 WESTERN DOG'S-TOOTH VIOLET - *ERYTHRONIUM GRANDIFLORUM*

3 CALOCHORTUS LUTEUS

4 BUTTERFLY TULIP - *CALOCHORTUS VENUSTUS*

5 CALIFORNIA POPPY - *ESCHSCHOLTZIA CALIFORNICA*

6 CALIFORNIA LILY - *LILIUM PARDALINUM*

Stretching along the coast ranges from the Oregon line southward nearly to the Bay of San Francisco, and in scattered groves even as far as Santa Cruz, is found the redwood, whose enormous trees form an extremely dense forest, extending to the lower part of Mendocino County. This forest occupies the foggy, wet stretch of land closely bordering the coast. The coast redwoods cover an area of 1,500,000 acres. East of this, in the northern coast ranges, is a mixed forest consisting of red fir and yellow and sugar pines. The coast ranges south of these forests are almost treeless, but are covered with grasses, and often with a variety of thorny bushes, cats-claw, manzanita, scrub oak, etc., which collectively are known as chaparral. Here and there among them are scattered oaks and digger pines. The ranges of southern California, which rise to greater altitudes, are, on their lower slopes, covered with chaparral, while above 5000 feet coniferous forests are found. The valleys of southern California contain some chaparral, with a little grass and many cacti and Spanish bayonet, being the vegetation which is peculiar to an arid region.

The great valley of California is, in its northern part, covered with a scattering growth of oaks, while the southern part is generally devoid of timber, and is more or less under cultivation. The marshes on the lower courses of the Sacramento are covered with tule reeds. The Sierra Nevada is, on its lower slopes, covered with a thick growth of chaparral, with a few oaks and digger pines, while above an altitude ranging from 3000 feet in the southern part to 1500 feet in the north begins the yellow-pine belt, which is composed mainly of trees of that species, with sugar pine, incense cedar, and red fir intermingled. This occupies a strip on the west slope of the range, extending up to an altitude of 8000 or 9000 feet, above which it is succeeded to the timber line, which ranges from 9000 to 10,000 feet, by trees of more Arctic character—firs, hemlock, and finally, at the timber line, by white-barked pine. On the east side of the range the succession is somewhat similar, but the belts are much narrower, owing to the abruptness of the range on this side. The plateau east of the range is a desert, with very little vegetation, and that of low shrubby growth. In the yellow-pine belt, upon the west slope of the sierra, there occur 10 groves of *Sequoia gigantea*, the largest and oldest tree on earth, ranging in size up to 33 or 34 feet in diameter, with heights of from 300 to 350 feet. These do not occur in pure growth, but scattered among the yellow pines. Most of the groves are within national forest reserves or national parks, but much of the land unfortunately is held in private hands, and the trees are being cut for lumber.

California may well be called the orchard of the United States. Many of the advantages of the Mediterranean zone are concentrated in the State. Frosts occur rarely. The fruit crop is generally abundant and of good quality. The coast section in particular is adapted to the culture of the vine, olive, orange, and lemon trees.

Fauna. As California extends north and south through nine degrees of latitude and ranges from arid deserts in the south to humid and forested mountains in the north, and from the lofty sierras on the east to the sea, it must not only embrace a large variety of animal life,

but include several distinct faunas adapted to its varied climates and terrenes, such as those of the coastal valleys and plains, of successive zones of altitude in the mountains, of the sandy southern semitropical deserts, etc. Few of its animals are of the same species as those found in the eastern half of the United States. California is closely allied, zoologically, to the interior basin and Rocky Mountain region. Among the characteristic mammals of the State are the grizzly and black bears; wolves, large and small, and several fur bearers; puma and lynx; varieties of the white-tailed and black-tailed deer, and in the extreme north the Columbian blacktail. The bison never entered the State; the wapiti did so formerly, but is no longer to be found there. The bighorn wanders in the high sierra, where also are found the peculiar little beaver-like sewellel and various picas. Several rodents, such as the golden and Douglas squirrels, are peculiar to these parts of the mountains, while the plains abound in burrowing rodents, among which are large hares that have increased since civilization reduced their enemies, until in the central and southerly parts of the State they have become a decided pest. The coast fauna comprises several representatives of the seal family. The birds of California include many species not known elsewhere. A species of vulture, the California condor, was the most remarkable, but is extinct save in Lower California. The two crested quails of the State are familiar to sportsmen, as also is the large ground cuckoo, called road runner. Another remarkable local bird is the California woodpecker, peculiar in storing great quantities of acorns in holes in the bark of trees for winter consumption. The islands off the coast, especially the Farallones, are well supplied with sea birds. Among reptiles two or three species of rattlesnakes occur all over the southern region, where also a great variety of lizards exists. The fishes of both the sea and fresh waters are numerous and valuable. Peculiar varieties are the rose fish, smelts, surf fish, herrings, rock trout, and various important food fishes of the cod family. The rivers of the north receive annually vast "runs" of salmon, which are different from the Eastern salmon. (See SALMON.) It is claimed that 130 varieties of fishes can be found in the markets of San Francisco. Few of these fishes are the same as Atlantic species, but many belong to groups well represented elsewhere. The care and protection of game animals and fish culture have received much attention. Oysters are cultivated to some extent, the California variety being small and having a peculiar flavor. Over 5000 persons are employed in the coast and river fisheries.

Geology. A large part of the area is underlain by sedimentary strata of a comparatively recent geometrical age. Triassic and Jurassic beds predominate in the northern and west-central parts, and Cretaceous and Tertiary beds in the coastal region as well as along the Nevada boundary. Along the Sierra Nevada and coast ranges volcanic rocks are strongly developed and cover wide areas. The central axes of these two great ranges are formed, however, by ancient igneous and metamorphic rocks. Granite is especially prominent in these localities and constitutes some of the highest peaks. The elevation of the Coast Range took place at the close of the Miocene period, while the sierras were formed largely by an uplift that occurred near the end

of the Jurassic period. Carboniferous strata occupy a large area in the central part of the State, but they inclose no coal seams of economic importance.

Mining. California is rich in mineral deposits, particularly gold, which is found in over 30 counties, and the rapid settlement and development of the State were due to this fact. Gold was obtained by washing as early as 1841, near San Fernando mission; but it was the discovery at Sutter's Mill, near Coloma, in 1848, that made evident the abundance of the metal and attracted the excited throngs of adventurers. Many of these engaged in river mining, i.e., washing in sheet-iron pans or wooden "rockers" the gold from the sands or gravels from or near river channels; others dug the gold "dry" from veins in the rocks. About 1851 sluices were introduced, by means of which the gravels or sands were run over the bottom of a wooden box provided with blocks of wood or round stones to catch the gold as it sank. Digging soon extended from the rivers and the gulches to the higher ground, where the difficulty of washing was increased; but in 1852 the hydraulic system was brought in. In this, continuous powerful streams of water are directed through nozzles upon a gold-bearing bank or deposit. This was so successful that whole hills were reduced and swept away, but this practice was soon forbidden by law, as the detritus threatened to choke the rivers and seriously damage the agricultural interests in the valleys below. Nearly all the mines are on the western slope and in the foothills of the Sierra Nevada in a belt of country about 220 miles long by 40 wide, extending into Oregon. The gold is found in a metallic condition, but is usually mixed with silver or other metals. In stream or alluvial deposits ("placers") it occurs as fine scales or coarse grains. In rocks it is found in quartz veins, and costly machinery must be used to crush the ore, from which the gold is extracted by amalgamation with quicksilver. Where, as often is the case, the gold-bearing gravels underlie volcanic rock several hundred feet thick, drift or tunnel mining combined with sluicing is necessary. The chief gravel-mining region extends from Mariposa County into Plumas County, or between parallels 37° and 41°. Most of the gold is now obtained from the quartz mines, especially in Nevada, Amador, Tuolumne, Calaveras, Kern, Shasta, and San Bernardino counties. Gold mining is to-day greatly facilitated by the application of electrical power, which the mountain streams are made to generate. The great prominence and significance of gold in the early years of the State are evident from the great size of the output, the annual average for the decade between 1850 and 1859 inclusive being estimated at over \$55,000,000, and constituting nearly the entire product of the United States. Following this period there was a constant decline in the output, which reached the minimum (\$12,000,000) in 1892; it then revived and for the last half-decade of the nineteenth century averaged over \$15,000,000 annually. The State continued to hold first place until 1897, when it was surpassed by Colorado, but it regained first place in 1910.

Mineral Production. The production of gold from the mines of the State in 1912 was 953,639.5 fine ounces, valued at \$19,713,478, compared with 954,869 fine ounces, valued at \$19,738,908 in 1911. The production in 1913

according to the figures of the Director of the Mint was valued at about \$20,000,000. In 1912 the total gold output from placers and from copper, lead, and zinc ores decreased, but the production from siliceous ores increased in nearly equal amount. Of the production in 1912, \$11,067,815 came from the deep mines, and of this amount \$10,771,759 was obtained from siliceous ores, \$293,946 from copper ores, \$1717 from lead ores, and \$393 from zinc ore. The placer mines of the State produced \$8,645,663, of which \$7,429,955 came from dredges, \$689,682 from hydraulic mines, and \$387,992 from drift mines, and \$138,134 from sluicing mines. The total output of the dredges from 1898 to 1912 has been \$55,415,191.

The leading counties in gold production are Amador, Yuba, Butte, Nevada, Sacramento, and Tuolumne. These counties in 1912 each produced gold valued at more than \$1,000,000. The largest amount was produced in Amador County. Of the counties named, Yuba and Sacramento are essentially dredging counties, while Amador and Tuolumne are mother-lode counties. The production from Shasta County is made from siliceous and copper ores, while from Nevada County it is mainly from the gold-quartz milling ores of the Grass Valley district. The five mother-lode counties—Amador, Calaveras, El Dorado, Mariposa, and Tuolumne—whose ores are mainly gold quartz, produced altogether in 1912 gold valued at \$4,741,497, compared with \$4,877,651 in 1911.

The silver produced in the State in 1912 was 1,300,136 fine ounces, compared with 1,270,445 ounces in 1911 and 1,840,085 ounces in 1910. Of the output in 1912, 792,445 ounces came from smelting copper ores, while siliceous gold-silver ores produced 409,873 ounces. The remainder came from placers, lead ores, and zinc ores. From the copper mines of Shasta County were produced 684,381 ounces of silver in 1912, compared with 706,445 in 1911, and 1,192,520 in 1910. The falling off is due to decreased copper smelting resulting from litigation by agricultural interests on account of smelter fumes. Mono and San Bernardino counties produced the largest quantity from silver-gold and dry or siliceous ores. In 1912 there were 12 siliceous mines and 25 silver-lead-zinc mines producing argentiferous ores in California. These were mainly in Inyo, Kern, Mono, and San Bernardino counties.

The production of copper in California in 1912 was 33,451,672 pounds, valued at \$5,519,526, a decrease of 2,864,464 pounds in quantity, but an increase of \$980,009 in value from the production of 1911. Copper is produced in Amador, Calaveras, Inyo, Kern, Medera, Mariposa, Mono, Placer, Plumas, San Bernardino, and Shasta counties. The heaviest production is from Shasta County, but the quantity of the output in recent years has materially decreased owing to the smelter-fume litigation and the resultant closing down of certain smelting plants. There were 45 mines producing copper in 1912. Altogether 408,622 tons of copper ore were treated, 85,659 tons less than in 1911. The decrease in the amount treated has been steady since 1909, from the causes noted above. The copper ores of the State in 1912 yielded, in addition to copper, 14,210.65 fine ounces of silver, valued at \$487,354.

There were produced in the State, in 1912, 1,144,731 pounds of lead, valued at \$51,512—a decrease of 253,380 pounds in quantity and of

\$11,403 in value from 1911. By far the greatest proportion of the lead is obtained in Inyo County, although some comes from Kern, Mono, Plumas, and San Bernardino counties. A small quantity of gold is obtained from the lead ore, and, in 1912, 35,492 ounces of silver, valued at \$21,838, were extracted from lead ores mined. The production of zinc in the State, in 1912, was 4,345,591, valued at \$299,846, compared with 2,807,035 pounds in 1911, valued at \$160,001. Most of this zinc comes from one mine, the ores of which are shipped for treatment to reduction works in other States. In 1912 there were three mines in the State which produced zinc.

The total value of the gold, silver, copper, lead, and zinc ores produced in the State in 1912 was \$26,383,946, compared with a value in 1911 of \$25,174,677 and in 1910 of \$27,020,405. In 1909 there was produced the largest value of these metals since 1905—\$28,841,050.

The remarkable increase in the production of petroleum in the State in recent years has been the most striking feature of that industry. In 1899 the production did not reach 2,000,000 barrels. In 1906 it had increased to 34,500,000 barrels, and in 1912 the wells of the State produced the stupendous total of 86,450,797 barrels, or about 39 per cent of the total output of the United States. This was an increase of over 5,000,000 barrels from the output of 1911, which was 81,134,391 barrels. The production of 1913 was about 98,000,000 barrels. The production of 1912 was valued at \$39,213,588, compared with \$33,719,080 for the product of 1911. There are three important oil fields in the State—the Coastal and Southern, the San Joaquin Valley, and the Kern County fields. The last named are the most productive. They include the famous Kern River and Midway fields, and the product in 1912 was 50,245,255 barrels. The San Joaquin Valley field, which includes Fresno County fields and the Coalingo fields, produced, in 1912, 19,911,320 barrels of oil. In the Coastal and Southern fields were produced 15,863,404 barrels. Several new fields of importance were opened in 1912 and 1913.

The production of coal in the State is not important. There were mined, in 1912, 10,978 short tons, valued at \$23,601. The coal fields are widely separated and are found chiefly in Contra Costa, Alameda, San Benito, and Monterey counties. The use of oil as a fuel has had the effect of reducing the demand for coal in the State and has hindered the developments of coal resources. In 1912 not less than 50,000,000 barrels of petroleum were used directly for fuel. Large quantities are used also in the place of coal for gas making. California oil is the principal fuel for locomotives as far north as Washington, and it has displaced coal on Puget Sound.

California is by far the largest producer of quicksilver. Out of a total product in the United States in 1912 of 25,064 flasks, 20,524 flasks were produced in this State. The value of the product in 1911 was \$1,053,941. From 1850 to 1912 the production of quicksilver was 2,124,732 flasks, valued at \$95,275,695. The greater part of the quicksilver is produced in San Benito County, which contains the New Idria mines, the most important producers of recent years in the Western Hemisphere. Considerable quantities are produced in Santa Clara County, in which are the new Almaden mines, credited with the greatest total output in the country, and the Guadalupe, which ranked after

the New Idria in 1912 as the greatest producer. In 1912 there were 17 producing quicksilver mines in California. There was a heavy falling off in production in 1913. The output in that year was about 15,400 flasks, valued at \$257,500.

California is one of the most important clay-working States. In the value of the products in 1912 it ranked eighth. It was the sixth State in the value of common brick, fifth in the value of front and fancy brick and terra cotta, third in the production of sewer pipe, and sixth in the value of fire brick. The total value of all the clay products in the State in 1912 was \$5,912,450. Of this, the common brick made was valued at \$2,198,303 and amounted to 349,796,000. Los Angeles and Alameda are the leading clay-working counties; the former leading in the manufacture of common brick. Alameda is the first in the manufacture of sewer pipe.

Agriculture. California has few equals among the States and, indeed, scarcely among the countries of the world, in natural agricultural possibilities. In no other part of the world is so great a variety of crops brought to so high a stage of development. Over the greater portion of the agricultural area the crops of both the temperate and the subtropical zones can be grown at will with equal success. Since 1850 the agricultural section of the population has increased more rapidly than any other. During the decade 1890–1900 the number of owners and tenants increased much more rapidly than did the total rural population, being contrary to the tendency shown in the two decades preceding. This is indicative of the movement now in process by which the large estates, under the influence of increased irrigation and intensive cultivation, are passing into the hands of smaller landowners. These large estates were partly the result of easy acquisition of land and partly of confirmation by the United States government of Mexican land grants to private individuals. The holders of these estates were at first opposed to subdividing them, and only recently have settlers been able to obtain desirable farms on them. Still the average size of the farms in 1910 (316.7 acres) was quite large, and there were 4693 farms which contained 1000 acres and over, constituting 61.9 per cent of the total farm acreage.

The earlier agricultural period was characterized by the great predominance of wheat raising. Many of the large holdings were almost exclusively devoted to this industry, giving rise to the large ranch or bonanza farms of world-wide fame. Thus the production of wheat became enormous, at one time exceeding that of any other State. This was accomplished for the most part without irrigation.

The total number of all farms in the State in 1910 was 88,197, compared with 72,542 in 1900—an increase of 15,655 in the decade. Out of an approximate land area of 99,617,280 acres, 27,931,444 acres were in farms in 1910. This was a decrease from the acreage in farms in 1900, which was 28,828,951. The improved land in farms in 1910 was 11,389,894 acres—also a decrease from the improved acreage in 1900, which was 11,958,837. The average acres per farm in 1910 was 316.7, compared with 398.4 in 1900. The total value of the farm product in the State, including land, buildings, implements, and machinery, domestic animals, poultry, and bees, in 1910 was \$1,614,694,584, compared with the value of 1900 of \$796,527,955, or

an increase of 102.7 per cent in the decade. The average value of all property per farm in 1910 was \$18,308, compared with the value of 1900 of \$10,980, and the average value of land per acre in 1910 was \$47.16 and, in 1900, \$21.87. The decrease in the percentage of improved lands noted above probably represents a change in the classification of land by many farmers, who in 1910 reported as "unimproved land" a large amount of acreage which was formerly called "improved." Of the farm operators in 1910 (who numbered 88,197), 66,632 were owners, 3417 were managers, and 18,148 were tenants. Of the 66,632 farms operated by their owners in 1910, 39,368 were free from mortgage. By far the larger number of farms in 1910 were between 20 and 49 acres, while over three-fifths of all the farms were from 10 to 174 acres in size. There were 58,926 native-born white farmers, 26,193 foreign-born white farmers, and 3078 negro and other farmers. Of the non-whites, 1816 were Japanese, 591 Indians, 512 Chinese, and 159 negroes.

Crops. The table below gives the acreage value and production of the principal crops in 1909 and in 1913. The figures for 1909 are from the thirteenth-census reports, and those of 1913 are estimates of the United States Department of Agriculture.

		Acreage	Prod. Bu.	Value
Corn.....	1913	55,000	1,815,000	\$1,597,000
	1909	51,935	1,273,901	1,077,411
Wheat.....	1913	300,000	4,200,000	3,990,000
	1909	478,217	6,203,206	6,323,983
Oats.....	1913	210,000	6,636,000	3,782,000
	1909	192,158	4,143,688	2,637,047
Rye.....	1913	8,000	120,000	90,000
	1909	7,027	70,683	65,846
Potatoes.....	1913	68,000	8,092,000	5,664,000
	1909	67,688	9,824,005	4,879,449
Hay.....	1913	2,400,000	3,600,000*	48,600,000
	1909	2,533,347	4,327,130	42,187,215
Cotton.....	1913	17,000	18,000†	1,119,000
	1909	324	183	11,744

* Tons.

† Bales of 500 pounds each.

The general character of agriculture in the State is indicated by the fact that in 1909 somewhat less than one-fifth of the total value of the crops was contributed by cereals, somewhat less than one-third by fruits and nuts, and more than one-fourth by hay and forage, the remainder representing 22.2 per cent of the total, consisting mostly of potatoes and other vegetables, grass and seeds other than cereals, sugar crops, flowers, plants, and nursery products. The total value of crops in 1909 was 60.6 per cent greater than in 1899, the increase being no doubt due in part to higher prices.

Of the principal cereals grown in the State, barley and oats showed a steady increase in the 30-year period from 1879 to 1909. On the other hand, corn shows a somewhat slow yet steady decline. The acres of corn harvested in 1879 were 71,781, compared with 51,935 in 1909. The acreage of wheat shows a still greater decline. In 1879 it was 1,832,429, while in 1909 it was 478,217. The crops showing the greatest increase in the period are hay and forage. In 1879 the acreage planted in these crops was 758,024, while in 1909 it was 2,533,347.

The total value of the live stock in the State in 1909 was \$123,024,652. The cattle numbered 2,077,025 and were valued at \$52,785,068; the

horses numbered 468,886, valued at \$47,099,196; mules, 69,761, valued at \$9,016,444; swine, 766,551, valued at \$5,106,803, and sheep 2,417,477, valued at \$8,348,997.

California is the chief beet-sugar-producing State in the Union. All the coast valleys are favorably situated in respect to temperature for the production of sugar beets. The first factory successfully operated was established at Alvarado in 1879. Since that time growth of the industry has been continuous. In 1912 there were 12 factories producing beet sugar. These used 1,037,283 tons of beets, producing 161,300 tons of sugar. The total production of beet sugar in the year was 317,363,000 pounds. In the Sacramento valley the acreage in sugar beets was 7800 and in southern California between 45,000 and 50,000.

About 12,000,000 pounds of hops were produced in 1909 from an acreage of about 9000. The value of the crop was \$1,731,110. Cotton is produced in Imperial County, and its development since 1909 has been rapid. Experiments in the growing of rice have been carried on, and results indicate the possibility of growing it in the Sacramento valley. Tobacco too has been within a few years fully established as an important product. For over four years extensive experiments in the production of Turkish seed were carried on in Tulare County. The total quantity produced in 1912 was 150,000 pounds, entirely in Fresno and Tulare counties. The agricultural lands of the State produce large quantities of vegetables, of which the most important is the potato. The acreage devoted to this crop in 1912 was 78,000, and the product was 10,140,000 bushels. Celery is an important vegetable and is grown on a large scale in Orange County. Nearly 1400 carloads were shipped in 1912. Lima beans, artichokes, cauliflower, lettuce, tomatoes, and onions are also raised extensively, as are flowers, plants, and nursery products.

Horticulture. Fruits were grown in California in the time of the Spanish possession, but outside the missions there were few serious attempts at horticulture. When the missions were broken up, the early fruit industry began to decline. After the American occupation, however, advantage was quickly taken of the conditions of climate and soil to develop fruit raising. Irrigation added large areas which previously had been impossible to cultivate. Many varieties of horticultural plants which are difficult or impossible to raise in other States are produced in California. This is especially true of the regions where rainfall is lightest and the advantages of irrigation are greatest, i.e., in the southern Pacific coast and in the San Joaquin valley. In recent years the development of fruit growing in the Sacramento valley has stimulated irrigation in that region.

The production of citrus fruits has become one of the chief industries of the State. California provides about 40 per cent of the total orange supply of the world and three-quarters of the total production of the United States. Although lemons have been grown in California for half a century, it is only during the last 20 years that they have attained commercial importance. The lemon is less hardy than the orange and comprises from 10 to 15 per cent of the citrus crop. The citrus-fruit industry has reached its largest development in southern California, which is made up largely of San Bernardino, San Gabriel,

CALIFORNIA SHRUBS



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CALIFORNIA SHRUBBY MONKEY-FLOWER - *MIMULUS GLUTINOSUS*
 CALIFORNIA LILAC - *CEANOTHUS THYRSIFLORUS*
 CHAMISO - *ADENOSTOMA FASCICULATUM*

4 SHRUBBY POPPY - *DENDROMECON RIGIDUM*
 5 MANZANITA - *ARCTOSTAPHYLOS MANZANITA*
 6 CALIFORNIA LAUREL - *UMBELLULARIA CALIFORNICA*

and San Fernando valleys, and in the coast regions in Orange and Los Angeles counties. The first regular orchard was planted for the purpose of profit in 1886, and since then the progress of the industry has been very rapid. The orange crop of northern California matures from four to six weeks earlier than it does in the southern part of the State, notwithstanding the fact that it is from 200 to 500 miles farther north. This unusual condition is due to the topography of the Pacific coast. The two large San Joaquin and Sacramento valleys in central and northern California lie between the two great mountain ranges extending north and south. The Coast Range shuts off the modifying influences of the sea, causing relatively higher night temperatures during the summer months than prevail in the southern part of the State. In addition to oranges and lemons, pomelos are grown in considerable extent, as are also citrons, guavas, limes, and pineapples.

The lemon industry in the State has been developed by small landowners. There are a few groves which contain from 150 to 1000 acres, but the average grove contains less than 10 acres.

No attempt has been made to record the acreage devoted to fruit raising in the State. Statistics relate to the number of trees planted. The total number of fruit trees in 1909 was 30,895,257. Of these 22,484,195 were bearing. Orange trees numbered 8,709,215; lemon trees, 1,320,969; pomelos, or grape fruit, 1,256,262. The total number of trees of tropical fruits, including oranges, lemons, pomelos, mandarins, and tangerines, was 10,103,242. The quantity in bushels produced in 1909 was 15,319,052. The value was \$16,076,051.

One of the largest and most important branches of fruit growing in the State is the cultivation of the raisin grape, the acreage of which is now by far the largest in the world. The first introduction of the raisin vine in California was in 1851, and development has been steady from that time. Many counties which have produced raisins within the past 20 years no longer do so, as it has been found that conditions are better for growing wines and table grapes or other fruits. Of the 58 counties in California, less than a dozen produce raisins in commercial quantities at the present time. Strong organization has been formed to control the production of raisins and to stimulate their consumption and use. The efforts of this organization have greatly increased the sale of raisins throughout the United States. Fresno County is the centre of the seeded-raisin industry, which grew up as the result of the invention of a raisin-seeding machine about 1870.

The production of olives in the United States is confined largely to California. It was estimated that in 1911 there was a total of 18,000 acres planted in olives in the State. The counties of San Joaquin and Sacramento valleys produced about 75 per cent of the entire crop. Olive oil was first made in Santa Barbara in 1872. The output of olive oil in 1912 was scarcely one-third of that of 1911, and of pickled olives from one-half to one-third. In 1910 there were 958,006 olive trees—836,347 bearing and 121,659 nonbearing. The quantity produced was 16,132,412 pounds, and its value was \$401,277.

Orchard fruits are produced in large quantities. The total production in 1909 was 31,502,000 bushels, valued at \$18,359,000. Plums and prunes, peaches and nectarines, apples and

apricots, are the most important orchard fruits. California has a monopoly of apricot growing, and in canned and dried forms the apricot is one of the leading fruits exported. Other orchard fruits grown in large quantities are pears, cherries, quinces, and mulberries. The growing of figs is one of the important horticultural industries. There were, in 1910, 483,528 fig trees, of which 269,001 were bearing. The total quantity produced was 22,990,353 pounds, valued at \$260,753. Experiments in date growing have been carried on for many years, and the success of some of the tests has encouraged a larger cultivation.

Of the small fruits, strawberries are by far the most important. The others include raspberries, loganberries, blackberries, and dewberries. The total acreage of small fruits in 1909 was 9687 compared with 6281 in 1899. The production in 1909 was 26,824,000 quarts, compared with 14,582,000 quarts in 1889, and the value was \$1,789,000 in 1909, as compared with \$911,000 in 1889.

In the production of canned apricots, peaches, and pears, and dried peaches and prunes, California ranks first among the States. In 1909 the value of the canned fruits produced was \$7,248,342, and of dried fruits \$18,212,316.

Statistics for the production of the most important fruits of 1912 will be found in the following figures. There were shipped 40,673 carloads of oranges and lemons, of which about 35,000 were oranges and about 6000 lemons. The number of boxes per car of oranges and lemons is about 396 for oranges and 336 for lemons. The total production of dried peaches and nectarines in 1912 was 53,500,000 pounds; dried pears, 3,500,000 pounds; dried prunes, 200,000,000 pounds; plums, 750,000 pounds; raisins, 185,000,000 pounds; canned fruits, 5,005,950 cases.

Viticulture. The introduction of European wine into California dates back to 1771. It was first brought from Spain by way of Mexico to the Catholic Missions. The Mission of San Gabriel at Los Angeles planted the first vineyard, and the planting of vines extended from mission to mission, until vineyards of from 5 to 30 acres stretched from San Diego to Sonoma. With the downfall of the Spanish power the missions waned, and with them the viticulture declined also. Production of wine continued to some extent, and in 1850 about 60,000 gallons of wine were produced in two counties, Los Angeles and Santa Barbara. In 1861 about 1400 different varieties of grapevines of Europe were propagated in Sonoma County. Cuttings from these vines were distributed among the growers in different parts of the State. From that time the manufacture of wine in California has had a continuous and marvelous growth. In 1890 the vintage amounted to about 15,000,000 gallons. In 1900 the production was over 8,000,000 gallons of sweet wines and 15,000,000 gallons of dry wines, or a total of over 20,000,000 gallons.

Some of the California vineyards are among the largest and best cultivated in the world. The wine-producing areas of the State are usually classified into dry-wine districts and sweet-wine districts. Those included in the former are situated chiefly in the valleys and hills of the counties of the Coast Range from Mendocino to San Diego. The sweet-wine district includes the great central valleys of Sacra-

mento and San Joaquin. This classification is not strictly logical, because both sweet and dry wines can be made in nearly, if not all, the grape-growing districts. Practically all the principal wine grapes of Europe have been introduced and tested in California. About four-fifths of the wine, both sweet and dry, however, is made from about a dozen varieties. The Zinfandel is the typical red-wine grape of California, and it is grown in larger quantities than any other. From it the bulk of all dry and sweet red wines is made. The average yield of vineyards varies from 1 to 2 tons per acre to 8 or 10 tons. The difference depends principally on soil, climate, and the methods of the grape grower. The production of sweet wine in 1911 constituted a record. It amounted to 23,467,444 gallons, of which 9,522,237 gallons were port, 8,559,872 sherry, 2,609,518 angelica, and 2,247,279 muscatel. The remainder was malaga, madeira, and tokay.

The manufacture of sparkling wine has been undertaken in recent years and promises to be successful. The production of natural champagne in bottles in 1913 was about 1,000,000 compared with 800,000 in 1912 and 580,000 in 1911.

Nearly all the brandy made in the United States is produced in California.

The total production of all vintages of wine in the State in 1912 was 47,491,772 gallons, of which 25,000,000 were dry wine and 22,491,772 were sweet. The brandy produced in that year was 6,153,131 gallons. In 1913 the estimated total production of wine was 39,719,113 gallons, of which about 22,000,000 were dry wine. The production of brandy in that year was 7,373,013 gallons, of which 4,460,707 gallons were used in the fortification of wines.

Irrigation. In nearly all sections of the State there is sufficient rainfall for the maturing of some crops, although there are other sections where no crops can be grown without

irrigation. The normal annual precipitation ranges from about 2 inches in the Imperial valley in the southeast to about 60 inches along the coast in the northwestern part. Irrigation is practiced to some extent throughout the State, but the largest part of irrigated land lies in the southern part of the Sacramento and the San Joaquin valleys and in the north. In 24 of the 58 counties, more than half of the farms are irrigated. The total area irrigated in 1910 was 2,664,104 acres. Of this, by far the larger part was irrigated through private and commercial enterprises. The United States Reclamation Service had up to that time irrigated 400 acres and the United States Indian Service 3490.

As in other States, streams are the principal source of supply of water for irrigation, but in California wells supply much more land than in any other State. Of the entire acreage crops in the State, slightly less than one-fifth is irrigated, the proportion varying widely for the different crops. Cereals are very generally grown without irrigation. Of the entire acreage for potatoes, about 50 per cent is irrigated, and of small fruits 71 per cent. Sugar beets are grown for the most part without irrigation.

The increase in irrigation during the decade 1900-10 was very large. The total number of farms irrigated in the latter year was 39,352, compared with 25,657 in 1900. The Colorado River, which is the division line between California and Arizona, is of great value in irrigating lands which otherwise would be arid. This river has been called the "Nile of America," as it is subject to a large rise annually. Its waters have turned the desert lands of the Imperial valley into fertile lands, and more will be claimed by the Yuma project of the United States Reclamation Service. See IRRIGATION.

Manufactures. Although agriculture and mining are the principal industries in California, the State has shown a marked increase

MANUFACTURES — CALIFORNIA

TABLE. — COMPARATIVE SUMMARY FOR 1909 AND 1904

THE STATE — ALL INDUSTRIES COMBINED AND SELECTED INDUSTRIES

INDUSTRY	Cen- sus	Number of estab- lish- ments	PERSONS ENGAGED IN INDUSTRY				Capital	Salaries	Wages	Value of products	Value added by manu- facture
			Total	Pro- pri- etors and firm mem- bers	Sal- aried employ- ees	Wage earn- ers (average num- ber)					
Expressed in thousands											
STATE — All industries	1909	7,659	141,576	8,077	18,203	115,296	\$537,134	\$22,955	\$84,142	\$529,761	\$204,523
	1904	6,839	120,040	7,402	12,283	100,355	282,647	14,399	64,657	367,218	151,492
Agricultural implements .	1909	25	749	19	108	622	2,359	123	451	2,670	1,229
	1904	25	585	19	87	479	2,240	99	349	1,484	760
Bread and other bakery products.	1909	864	5,801	1,077	706	4,018	8,056	663	3,075	17,710	7,333
	1904	615	3,808	737	293	2,778	3,327	214	1,991	10,619	4,863
Brick and tile.....	1909	78	1,879	35	141	1,703	9,169	162	1,146	2,756	1,804
	1904	69	1,504	46	101	1,357	3,929	102	825	1,916	1,581
Butter, cheese, and con- densed milk.	1909	161	918	119	202	597	2,829	202	466	12,761	1,621
	1904	281	997	269	125	603	2,107	78	414	7,821	1,361
Canning and preserving. .	1909	196	8,714	148	809	7,757	18,316	1,080	3,454	32,915	8,906
	1904	236	8,510	160	611	7,739	11,187	797	2,800	26,083	7,428
Carriages and wagons and materials.	1909	155	1,015	185	70	760	1,635	74	610	2,052	1,203
	1904	198	1,277	248	49	980	1,730	51	715	2,352	1,500
Cars and general shop con- struction and repairs by steam rail'd companies	1909	42	9,688	.....	346	9,342	4,721	379	8,394	18,719	9,170
	1904	28	8,522	.....	271	8,251	4,047	313	6,068	9,836	6,585

MANUFACTURES. — TABLE (Continued)

INDUSTRY	Cen- sus	Number of estab- lish- ments	PERSONS ENGAGED IN INDUSTRY				Capital	Salaries	Wages	Value of products	Value added by manu- facture
			Total	Pro- pri- etors and firm mem- bers	Sal- aried employ- ees	Wage earners (average num- ber)					
Cars and general shop con- struction and repairs by street rail'd companies	1909 1904	21 3	2,002 943	..... .....	100 91	1,902 852	\$2,139 144	\$97 94	\$1,676 672	\$3,009 1,228	\$1,857 767
Cement.....	1909 1904	8 4	2,521 628	..... .....	114 32	2,407 596	24,014 4,856	195 89	1,650 236	6,504 1,601	4,322 937
Clothing, men's, includ- ing shirts.	1909 1904	74 98	2,859 3,199	272 287	202 144	2,385 2,768	2,258 1,540	201 129	1,050 1,146	5,121 5,238	2,226 2,475
Coffee and spice, roasting and grinding.	1909 1904	44 45	707 627	27 42	328 254	352 331	3,324 2,221	532 343	245 196	6,492 4,683	1,875 1,432
Confectionery.....	1909 1904	89 93	1,410 1,564	102 .05	306 225	1,002 1,234	2,123 1,810	271 216	459 533	3,624 3,506	1,486 1,859
Cooperage and wooden goods, not elsewhere specified.	1909 1904	38 31	502 527	40 28	46 32	416 467	1,547 798	67 47	323 347	2,167 1,718	588 584
Copper, tin, and sheet-iron products.	1909 1904	233 123	2,511 2,279	317 147	256 132	1,938 2,000	7,180 9,657	319 238	1,659 1,299	6,804 5,938	3,239 2,650
Fertilizers.....	1909 1904	15 14	278 168	1 10	51 35	226 123	2,097 904	72 39	155 69	2,313 894	517 375
Flour-mill and grist-mill products.	1909 1904	125 122	1,392 1,300	82 94	362 317	948 889	13,424 11,467	514 443	732 659	25,188 20,203	3,296 3,071
Food preparations.....	1909 1904	129 75	1,108 661	171 122	221 110	716 429	3,332 846	227 87	406 190	5,508 1,587	1,538 649
Foundry and machine- shop products.	1909 1904	543 388	10,218 7,770	470 368	1,371 814	8,377 6,588	28,693 16,125	1,832 1,091	7,312 4,913	26,731 17,595	13,830 10,213
Furniture and refrigera- tors.	1909 1904	129 90	1,978 1,381	124 85	201 102	1,653 1,194	3,062 2,451	226 114	1,507 887	4,496 2,834	2,638 1,544
Gas, illuminating and heating.	1909 1904	74 53	2,538 1,303	1 1	871 454	1,666 848	47,075 31,286	824 391	1,408 650	8,927 5,412	6,323 4,228
Ice, manufactured.....	1909 1904	77 54	854 517	35 35	153 67	666 415	7,781 3,550	212 71	572 335	2,331 1,307	1,767 1,008
Iron and steel, steel works and rolling mills.	1909 1904	5 4	1,085 808	..... .....	47 35	1,038 773	2,646 1,110	81 53	829 492	3,520 1,489	1,172 710
Leather goods.....	1909 1904	88 97	946 973	79 99	157 99	710 775	1,945 2,075	148 112	458 488	2,244 2,125	1,143 1,109
Leather, tanned, curried, and finished.	1909 1904	40 49	1,547 1,670	20 39	129 116	1,398 1,515	8,535 6,368	215 184	988 945	9,367 8,072	2,328 2,160
Liquors, distilled.....	1909 1904	33 28	264 131	26 18	45 37	193 76	2,476 1,028	56 36	128 50	5,353 1,165	4,518 790
Liquors, malt.....	1909 1904	83 97	1,626 1,511	48 92	282 214	1,296 1,205	18,804 10,925	545 355	1,391 1,145	9,319 7,511	6,760 5,261
Liquors, vinous.....	1909 1904	181 273	1,691 1,588	157 240	247 202	1,287 1,146	20,189 10,181	429 230	682 656	8,937 6,689	4,263 3,020
Lumber and timber prod- ucts.	1909 1904	644 582	25,079 20,612	547 545	1,597 1,148	22,935 18,919	55,165 37,904	2,237 1,432	15,651 12,789	45,000 34,615	26,631 23,086
Marble and stone work..	1909 1904	128 69	1,724 992	155 84	154 71	1,415 837	3,145 1,814	210 83	1,241 807	3,380 2,395	2,197 1,390
Mattresses and spring beds.	1909 1904	35 31	671 520	25 34	118 63	528 423	1,351 592	149 65	361 237	2,164 1,010	921 535
Paint and varnish.....	1909 1904	35 22	530 395	14 13	120 89	396 293	2,675 1,617	158 86	275 201	3,758 2,370	1,106 692
Petroleum, refining.....	1909 1904	29 19	1,146 840	4	212 162	930 678	13,881 5,453	367 212	801 477	17,878 5,749	3,980 1,618
Printing and publishing..	1909 1904	1,240 1,091	12,215 10,444	1,151 1,052	3,508 2,312	7,556 7,080	17,198 11,746	3,829 2,315	6,432 5,182	25,032 19,127	18,705 14,602
Slaughtering and meat packing.	1909 1904	94 76	2,135 1,659	111 84	383 288	1,641 1,287	11,463 4,879	550 351	1,307 914	34,280 22,013	5,832 3,261
Tobacco manufactures...	1909 1904	332 379	2,189 2,552	613 695	111 72	1,465 1,785	1,622 1,245	133 66	857 823	3,360 3,192	2,143 2,095

in manufactures during the last 40 years. The natural resources of the State give rise to several of its leading industries, such as the lumber industry, canning and preserving, flour and grist milling, petroleum refining, the refining of beet sugar, the wine industry, and the manufacture of cement. The high cost of fuel, the greater part of which had to be brought from outside of the State, retarded the early development of manufactures, but the discovery of an abundance of oil, the developments of the oil fields, and the utilization during recent years of electricity generated by water power, have given a decided impetus to manufactures.

The gross value of products per capita of the total population increased from \$119 in 1869 to \$223 in 1909, and the proportion which the manufactures of the State represented of the total value of the products of manufacturing industries in the United States advanced from 1.6 per cent to 2.6 per cent during the same period. In 1869 California ranked sixteenth among the States in gross value of manufacturing products. It had advanced to eleventh place in 1909. The table given on page 337 presents the most important details in relation to manufactures in California in 1909 in comparison with 1904. Only those industries the value of whose annual products is \$2,000,000 or more are given.

From this table it will be seen that the State had, in 1909, 7659 manufacturing establishments, which gave employment to an average of 141,576 persons during the year and paid out \$107,097,000 in salaries and wages. Of the persons employed, 115,296 were wage earners. These establishments turned out products to the value of \$529,761,000, to produce which materials costing \$325,238,000 were utilized. The value added by manufacture was thus \$204,523,000, which in general represents the net wealth created by manufacturing operations during the year. These totals do not include the statistics for an establishment operated by the Federal government, the United States Navy Yard at Mare Island. In 1909 this plant operated an average of 1917 wage earners, and the value of the work performed was \$4,335,000. The total brings out the fact, in general, that the manufacturing industries of California in most respects showed a higher rate of development during the five-year period 1899-1904 than during the succeeding five-year period 1904-09. During the period 1899-1904 the average number of wage earners increased 30 per cent; the value of the products, 42.7 per cent, and the value added by manufacture, 63.8 per cent. For the later period 1904-09 the corresponding percentages were 14.9, 44.3, and 35 respectively. Limits of space prevent the inclusion in this table of any industries the value of whose products is less than \$2,000,000 per year. This excludes a great many important industries, such as the beet-sugar industry, the manufacture of glass, shipbuilding, smelting and refining of copper, smelting and refining of lead, sugar refining, not including beet sugar, and the manufacture of woolen, worsted, and felt goods. The products of all these industries exceeded \$500,000 each in 1909.

The most important single industry in the State is that connected with lumber and timber products. It embraces logging operations, saw mills, planing mills, and establishments engaged in the manufacture of wooden packing

boxes. It does not include mills engaged exclusively in custom sawing. It gave employment in 1909 to 22,935 wage earners, or 19.9 per cent of the total for all manufacturing industries, and the value of its products amounted to \$45,000,000, or 8.5 per cent of the total. While the growth of this industry during the five-year period 1904-09 was considerable, its development was much less rapid during the earlier period 1899-1904. The production of rough timber in 1909 in millions of feet was 1,143,507, compared with 737,035 in 1899. The production of lath in thousands was 32,615 compared with 11,507 in 1909, and the shingles produced in thousands numbered 572,342, compared with 650,090 in 1899. The woods which supply the raw material are almost exclusively conifers. The hard wood cut in 1909, practically all of which was California or tan-bark oak, formed only $\frac{1}{4}$ of 1 per cent of the total lumber production during the year. More than 45.6 per cent of the lumber output in 1909 was California redwood, a species which does not occur in saw-log size outside of California. The chief among the other species sawed into lumber were Western pine, with a production of 364,748 M feet board measure, Douglas fir, with a production of 88,854 M feet, and sugar pine with a production of 88,822 M feet. The noteworthy peculiarity of the lumber industry in the State is the fact that the manufacture of shingles, while carried on to some extent in connection with that of lumber, nevertheless amounts practically to a separate and distinct industry. Over 88 per cent of the shingle output of the State for 1909 was manufactured from redwood, which lumber possesses in a very high degree the qualities most desirable for shingle material.

The second industry in point of importance is the slaughtering and meat packing. This classification includes wholesale slaughtering and meat-packing establishments and those engaged in the manufacture of sausage only. The animals slaughtered are mainly cattle and sheep from the foothills and lower mountain slopes and from the plateau regions of the north-eastern part of the State and southeastern Oregon. About half of the stock slaughtered is raised within the State.

The canning and preserving industry, the third in point of importance, dates from 1875, although its real importance and developments did not begin until several years later. See *Horticulture*. Canned fruits decreased in relative importance during both five-year periods, although the value of the output remained approximately the same. The value of the output in 1909 showed an increase of \$270,259, or 3.9 per cent, as compared with 1904; this increase, however, was not sufficient to make up for the decrease from 1899 to 1904, so that a decrease of \$91,717, or 1.2 per cent, is shown for the decade as a whole. The fruit most largely canned in 1909 was the peach, the value of which constituted 9.12 per cent of the total reported for the industry.

The value of the vegetables canned increased throughout the decade, the greater increase from 1904-1909 being much higher than during the preceding five-year period. The value of canned asparagus formed over one-half the value of all canned vegetables reported in 1909.

For notes on the production of petroleum in the State, see the paragraph *Mineral Production*.

The automobile industry shows a much higher rate of increase than any other of the large industries. The value of the product in 1909 was more than 40 times as great, and the value added by manufacture more than 33 times as great as in 1904. The distillery, cement, food-preparation, and petroleum-refining industries also show remarkable increases in both value of products and value added by manufacture during the same period.

As will be seen from the table, the average number of persons engaged in manufacturing during 1909 was 141,576, of which 115,296 were wage earners. Of the remaining, 13,640 were proprietors and officials and 12,640 were clerks. For all the industries combined, 86.9 per cent of the average number in 1909 were males, 16 years of age and over; 12.2 per cent females, 16 years of age and over; and $\frac{1}{10}$ of 1 per cent were children under the age of 16. A majority of the adult female wage earners were employed in the canning and preserving, men's clothing, printing, and publishing industries. The canning and preserving and the printing and publishing industries were the only ones giving employments to an average of more than 100 wage earners under 16 years of age. Together they employed one-third of the total number of such wage earners.

For a majority of wage earners employed in the manufacturing industries of the State, the usual hours of labor range from 54 to 60 a week; 21.1 per cent of the total were, however, employed in establishments where a week of less than 54 hours prevailed, and 8.8 per cent in establishments where the hours were more than 60 per week.

In 1909, 55.7 per cent of the total value of manufacturing products was reported for cities having over 10,000 inhabitants, and 60.4 per cent of the average number of wage earners in manufacturing industries were employed in such cities.

The only cities of the State having a population of over 100,000 inhabitants are San Francisco, Los Angeles, and Oakland. In San Francisco in 1909 there was an average of 28,244 wage earners, compared with 38,429 in 1904 and 32,555 in 1899. The value of the products of the manufacturing industries of the city in 1909 was \$133,044,069, compared with \$137,788,233 in 1904, and \$107,023,567 in 1899. The decrease in the five-year period 1904-09 is due chiefly to the conditions which followed the fire of 1906. In Los Angeles, in 1909, 17,327 wage earners were employed, compared with 10,424 in 1904 and 5173 in 1899. The value of the product of the industries in 1909 was \$68,586,274, compared with \$34,814,475 in 1904 and \$15,133,696 in 1899. In Oakland there were, in 1909, 6905 wage earners, compared with 3353 in 1904 and 2478 in 1899. The value of the product of the industries was \$22,342,926 in 1909, \$9,014,705 in 1904, and \$5,368,258 in 1899. Other cities having more than 1000 wage earners and a product valued at more than \$4,000,000 in 1909 were Sacramento, Stockton, Fresno, San José, San Diego, and Berkeley. With the exception of San Francisco, every city shows an increase in the value of products from 1904 to 1909.

Lumbering. See *Manufactures*.

Fisheries. The latest authoritative statistics for fisheries in the State are for the year 1908. Salmon stands first, both in quantity and value,

among the species of fish taken in California waters, the State ranking third in the country, both in quantity and in value of the salmon caught. The amount taken in 1908 was 9,211,000 pounds, valued at \$471,000. Of the total quantity, 79 per cent was taken from the Sacramento River. Striped bass ranks second in value, and cod third. The oyster industry has greatly advanced in recent years. The amount taken in 1908 was 729,000 pounds, valued at \$337,000. There has been a steady decrease in whale products for several years. Whalebone and oil were valued at \$119,000 in 1909, compared with \$393,000 in 1904. Other important fish taken are shinook, sardines, sole, flounders, white sea bass, and codfish. The total number of persons employed in fisheries in the State in 1908 was 4129. The value of the products was \$1,970,000.

Transportation. The Sacramento and San Joaquin rivers are the principal streams, the former navigable as far as Red Bluff, 262 miles above its mouth, and the San Joaquin navigable, at dry water, as far as Hills Ferry, 195 miles from its mouth. The channel up to Stockton is open throughout the year. Wheat and barley are shipped by steamboat and barges down these streams to tidewater. An Act of Congress approved March 1, 1903, created the California Débris Commission to regulate the hydraulic mining in the territory drained by these river systems and to adopt plans to improve and protect navigation on these streams. The State also has contributed towards the improvement of the Sacramento and Feather rivers. In 1911-13 the Federal government dredged the harbor of Los Angeles and built a breakwater. It also improved the San Francisco harbor by the removal of rock and made improvements in other harbors, including those of San Diego and Oakland. San Francisco Bay, which has an area of about 450 square miles, is by far the most important harbor in the State. In this bay are located the cities of San Francisco and Oakland. Los Angeles and San Diego in southern California are the ports of the State next in importance. Several trunk lines and local railways, which operated 7511 miles of track in 1912, furnish excellent transportation facilities by land. Two important transcontinental lines, the Southern Pacific and the Atchison, Topeka, and Sante Fe, enter the State from the south. The Southern Pacific has a line running through the central part of the State which connects with the Union Pacific at Ogden, Utah. Another line extending north connects with the line of the Oregon Railway Navigation Company at Portland, Oregon. In 1911 there were 46 steam railroads in the State and 22 electric railways, with a mileage of 1572.

Population. California is the most populous Western State. The population has increased steadily, and the percentage of increase between 1900 and 1910 was 60.1 per cent. In this decade the State rose from the rank of twenty-first to the rank of twelfth. The population by decades is as follows: 1850, 92,600; 1860, 379,900; 1870, 560,200; 1880, 864,700; 1890, 1,208,000; 1900, 1,485,053; 1910, 2,377,549; 1920, 3,426,861. The estimated population on July 1, 1914, was 2,757,895. The population per square mile in 1910 was 15.2 compared with 9.5 in 1900 and 7.8 in 1890. Of the total population, 1,106,533, or 46.5 per cent, were in 1910 native whites of

native parentage; 635,889, or 26.8 per cent, were native whites of foreign or mixed parentage; 517,250, or 21.8 per cent, were foreign-born whites. The proportion of native whites of native parentage increased somewhat during the decade 1900-10. The Indians in 1910 numbered 16,371, compared with 15,377 in 1900. The Chinese numbered 36,248 in 1910, compared with 45,753 in 1900, and 72,472 in 1890. The Japanese numbered 41,356 in 1910, compared with 10,151 in 1900 and 1147 in 1890. Of the total population 1,322,978 were males and 1,054,571 females. There were about 125.5 males to 100 females in 1910. In 1900 the ratio was 123.5 to 100. Among native whites the ratio in 1910 was 108.7 to 100, and among foreign-born whites 169.9 to 100. The urban population in 1910 was 1,469,739, compared with 810,193 in 1900. The rural population was 907,810, compared with 674,860 in 1900. Therefore, while the percentage of urban population increased 81.4 over 1900, the rural population increased only 34.5. Males of voting age in 1910 numbered 920,397, compared with 544,087 in 1900. There were, in 1910, 43 incorporated towns, having a population above 4000, and their inhabitants constituted about 50 per cent of the total population. Following are the leading cities with their populations in 1910 and 1900: San Francisco, 416,912, 340,782; Los Angeles, 319,198, 102,479; Oakland, 150,174, 66,960; Sacramento, 44,696, 22,282; Berkeley, 40,434, 13,214; San José, 28,946, 21,500; Stockton, 24,892, 12,470; Alameda, 23,383, 16,463; Stockton, 23,253, 17,506. See also the separate articles on these cities.

Militia. The organized militia of the State includes three regiments of infantry of 12 companies each, one squadron of four troops of cavalry, two separate batteries of field artillery, one company of signal troops, 11 companies of coast-artillery corps, and detachments of sanitary troops. The total strength of the militia on June 30, 1912, was 3425, of whom 3191 were enlisted men, and 234 officers. The State designation is the National Guard of California. The State headquarters are at Sacramento, and the commander in chief is the Governor.

Education. The State has always been among the most progressive in its educational policy. Its system is wide in scope and thorough in administration. In the length of its school year (186 days) it exceeds that of any State west of the Alleghanies. The problem of small rural districts affords much difficulty, but in the yielding of this the State has succeeded better than most others. The Legislature of 1911 passed a new compulsory education law, which sets the age for school attendance in the State from 8 to 15. There are, however, many exceptions to this rule. According to the thirteenth census the school population of the State in 1910 was 555,554. The total number attending school in that year from the ages of 6 to 20 was 377,666. Of these, 205,043 were of native parentage, and 129,155 were of foreign or mixed parentage, and 17,815 were of foreign-born parentage. There were 2936 negroes in the schools. In 1913 the total enrollment in the public schools, according to the report of the State Superintendent, was about 430,000, with an average daily attendance of about 400,000. The teachers numbered about 14,500, of whom 10,000 were in the elementary schools.

Annual expenditures for education in recent years have exceeded \$20,000,000. The average yearly salary paid to teachers in the elementary schools in 1912 was \$1010.18 for men and \$726.94 for women. In that year there were 229 high schools maintained in 55 counties. There were, in 1910, 74,902 illiterates, or 3.7 per cent; in 1900 there were 58,959, or 4.8 per cent of the total population. The illiteracy among the native whites in 1910 was 5 per cent, among whites of foreign or mixed parentage, 6 per cent, among foreign-born whites, 10 per cent, and among negroes, 13.4 per cent. The increased number of illiterates in 1910 was due to the increase in the foreign-born population.

There are normal schools at Chico, Fresno, Los Angeles, San Diego, San Francisco, San José, and Santa Barbara. The last named is a State Normal School of Manual Arts and Home Economics. The most important universities are the University of California and the Leland Stanford Junior, which rank with the foremost institutions of the country. Other colleges are Pomona College, Claremont, Occidental College, St. Vincent's College, University of Southern California at Los Angeles, Mills College at Mills College, St. Mary's College at Oakland, Throop College of Technology at Pasadena, St. Ignatius University of San Francisco, College of the Pacific at San José, University of Santa Clara at Santa Clara, and Whittier College at Whittier. Theological seminaries include Berkeley Bible Seminary, the Pacific Coast Baptist Theological Seminary, the Pacific Theological Seminary, and the Pacific Unitarian School for the Ministry at Berkeley, the Maclay College of Theology of the University of Southern California at Los Angeles, St. Patrick's Seminary at Menlo Park, San Francisco Theological Seminary at San Anselmo, and the Church Divinity School of the Pacific at San Francisco. The summer schools include the Cathedral Oaks School of Art at Alma, California School of Arts and Crafts, and the University of California at Berkeley, Krotina Institute of Theosophy, the Public Vacation Schools, the University of Southern California, and Y. M. C. A. Summer School at Los Angeles, the Summer Institute of Mechanic and Household Arts at Mount Hermon, the San Diego State Normal School at San Diego.

Finance. In 1908 a constitutional amendment was passed, which provided for raising the revenue of the State, chiefly from a percentage tax, on the gross earnings of railroad, telegraphs, telephone, and other public-utility companies. Property tax is reserved exclusively for local purposes. The Legislature of 1911 created a State Board of Control, composed of three members, to be appointed by the Governor. In November, 1912, an amendment changing the system of depositing public funds was adopted. The cash receipts for the fiscal year ending June 30, 1912, were \$39,323,133. The disbursements for the same period were \$36,620,919. The balance at the beginning of the fiscal year was \$7,453,602, and at the end of the fiscal year \$9,903,533. The chief receipts are from county taxation and from the taxation of franchises and corporations. The chief expenditures are for education, expenses of State institutions, and for the administration of State officers.

Banking. On June 14, 1912, there were 519

State banks in California, with total resources amounting to \$666,598,510. The national banks, on Sept. 4, 1912, numbered 231, with total resources of \$501,213,995. In 1912 there were 132 savings banks with 597,159 depositors and deposits amounting to \$407,006,665. The State banks included 150 commercial banks, 166 departmental banks, and 7 trust companies. California stands fifth in banking strength among the States. It is surpassed only by New York, Pennsylvania, Massachusetts, and Illinois. In savings-bank deposits alone California outranks Illinois and is exceeded only by New York, Massachusetts, Pennsylvania, and Connecticut. The average amount of each deposit in the savings banks, in 1912, was \$681.16. The total deposits in all the banks in 1912 was \$795,604,872. Bank clearings of San Francisco in 1912 amounted to \$2,677,561,952 and of Los Angeles to \$1,168,941,700. Six other cities had bank clearings exceeding \$35,000,000 in 1912.

Charities and Corrections. The Legislature of the State has devoted much attention to improved methods of dealing with the problems relating to charities and corrections. In 1911 the State Board of Charities and Corrections received new and increased powers. In 1903 juvenile courts were first established. This law has been amended by successive legislatures. The Legislature in recent years has also passed successive measures relating to child labor. In 1905 a child-labor law was enacted, and this was amended in 1907, to forbid the employment of children under 14. It was further amended in 1911, when the age limit was raised from 14 to 15, and the employment of minors under 18 after 10 P.M. was forbidden. Children over 12 may work on a special permit from a judge of the juvenile courts. The Legislature of 1911 authorized the establishment of a State reformatory for first offenders, between 16 and 30 years of age. Penal institutions include the State prisons at Folsom City and San Quentin, a State Reform School at Whittier, and the Preston School of Industry at Ione. The charitable institutions include the Stockton State Hospital, the Napa State Hospital, the Agnew State Hospital, the Mendocino State Hospital, and the Southern California State Hospital. In addition to these are several insane asylums, a home for the care and training of feeble-minded children at Eldridge, Institute for the Deaf and Blind at Berkeley, and the Home for Adult Blind at Oakland. There are soldiers' homes at Yountville and near Santa Monica. The total number of persons in all State institutions in 1913 was 13,280. The Legislature of 1913 provided for two new State institutions, a State Training School for Boys and a Psychopathic State Hospital.

Government. The present constitution became operative in 1879. A proposed amendment must have a two-thirds vote of each house, and be approved by a vote of the State electors. A proposition to revise the constitution must likewise receive a two-thirds vote of the Legislature and the approval of the people, and the text drawn up in the resulting constitutional convention must also be submitted to the people for their approval.

There have been many amendments to the constitution, the most important of which will be noted in the various paragraphs below, to which they relate. In 1911, 21 constitutional amendments were adopted by popular vote. The

most important of these were amendments providing for the initiative and referendum and for woman suffrage.

Legislature.—Senators (40) hold office for four years, Assemblymen (80), for two years. The Legislature meets in biennial sessions on the first Monday after the first day of January of odd years, and the pay of the members (\$8 per day and 10 cents mileage) is limited to 60 days. The Governor may convene extra sessions, but the power to legislate at these is restricted to the specified subject. The House impeaches, while the Senate acts as a court of impeachment.

Among the amendments carried on Oct. 10, 1911, was a unique provision for two distinct sessions of the Legislature. There is, first, a session of 30 days in which bills may be introduced, followed by a recess of 30 days, and then another and final session of 30 days in which no bills can be introduced, except by a two-thirds vote.

Executive.—The Governor, Lieutenant Governor, Secretary of State, Comptroller, Treasurer, Attorney-General, and Surveyor-General are each elected for a term of four years. A two-thirds vote of each house overcomes the Governor's veto. Money appropriation bills may be vetoed in part. In case of a vacancy in the office of Governor, the Lieutenant Governor takes his place, and in turn is succeeded by the President pro tempore of the Senate. The Governor grants reprieves, pardons, and commutations of sentence.

Judicial.—The Supreme Court, the members of which are elected for a term of 12 years, consists of a Chief Justice and six associates, and is divided into two departments, which may sit separately or as one court. Each county has a Superior Court, whose members are elected for a term of six years. Inferior courts are established by the Legislature. No judge of Supreme or Superior Court can receive his salary unless he swears that no case in his court submitted 90 days previous remains unattended to.

Suffrage and Elections.—As a result of the adoption of a constitutional amendment on Oct. 10, 1911, women are admitted to the suffrage on an equal basis with men. The general qualifications for voters are that they shall have lived one year in the State, 90 days in the county, and 30 days in the voting precinct; that they shall not have been convicted of infamous crimes, embezzlement, or misappropriation of public money, and that they shall be able to read the constitution and write their names. Chinese are excluded from rights of citizenship. Elections are governed by a primary law which corresponds practically to the Oregon law. The direct primary law was simplified in 1911. Nominations other than by primary must be made by a petition with a certificate for each signer. At an extra session of the Legislature in 1911 the State was redistricted into senatorial, assembly, and congressional districts. At the regular session of 1911 provision was made for a presidential primary election to be held on the second Tuesday of May in the years of presidential elections. Voting by voting machines is permitted, and in 1911 the law in regard to such machines was revised. The ballot law provides for the office-group form in nominations, with names arranged in rotation and in alphabetical order for local officers, with the party name following the name of the

office, and with a blank space in each party group for the addition of the name of the elector. An assembly ballot and a card containing instructions must be mailed to each voter prior to the election, and pamphlets containing arguments for or against measures proposed for referendum must be distributed to voters. Pamphlets on proposed constitutional amendments must be distributed to public schools.

Local and Municipal Government.—There is a uniform system of county governments, and general laws are enacted for the organization of townships. Laws affecting municipal corporations must be general laws, applying to classes of municipalities made upon the basis of population. The towns and cities are permitted to adopt a commission form of government, and the following cities were governed by this plan in 1914; Berkeley, Modesto, Monterey, Oakland, Pasadena, Sacramento, San Diego, San Luis Obispo, San Mateo, Santa Cruz, Stockton, Vallejo, Pomona, Petaluma, and San Bernardino. The municipalities of the State were reclassified in 1911. Cities of over 400,000 are in the first class; those between 250,000 and 400,000 are in the first and one-half class; those between 100,000 and 250,000 are in the second class; those between 23,000 and 100,000, third class; between 20,000 and 23,000, fourth class; between 6000 and 20,000, fifth class; and those under 6000, sixth class. Cities already organized, however, are not included in this classification. In the cities in which the commission form of government prevails, the initiative referendum and recall are included in the plan of government. The recall of election officers and the initiative and referendum are also provided for in counties and subdivisions of counties. These methods of government are not limited to municipalities which have the commission form of government. Cities and towns are permitted to draw up their own charters.

Other Constitutional and Statutory Provisions.—No corporation formed under the laws of the State can employ, directly or indirectly, any Chinese or Mongolian, and contracts for coolie labor are void. Appropriations to sectarian schools are prohibited. The legal rate of interest is 7 per cent, but any rate is allowed by contract. Women may enter or pursue any lawful business, vocation, or profession, and the property of married women belongs to them alone. There are stringent measures for the regulation of trusts. A law provides for local option in incorporated towns and cities, and in supervisorial districts outside of cities or towns, on a petition of 25 per cent of the qualified voters. A public-utilities commission has general control over the public utilities of the State. The Legislature of 1911 reorganized the State Bureau of Labor and made the term of the commissioner during good behavior. The law requires all physicians to report on occupational diseases to the State Health Board, for the transmission to the commissioner of labor. There is a workmen's compensation law with liberal provisions. Giving or selling tobacco to minors is a misdemeanor. In 1911 a State flag was adopted. This shows a grizzly bear in dark brown on a white field, with a red stripe at the bottom of the flag and a red star in the upper left-hand corner. The flag bears the legend "California Republic." The Legislature of 1913 enacted, in addition to the alien land law, which is described in the section

History below, a "blue-sky" law, a State civil-service law, a law providing for mothers' pensions, a water-conservation act, a measure providing for minimum-wage commission for women and minors, with authority to fix wages and hours of labor, an eight-hour law for underground workers, a 16-hour law for train and engine men, a law providing for nonpartisan elections in counties, and an act providing for the creation of a legislative council bureau to advise and assist the Legislature.

Sacramento is the capital. The State has 11 Representatives in the Lower House of the national Congress, having gained 3 by the new apportionment based on the census of 1910.

Religion. From an early date the Roman Catholics have been very active in missionary work. Nearly all the Spanish element of the population and a large part of the Indian population are members of that church. The Methodists, Presbyterians, Congregationalists, and Baptists follow, in the order named, and the other leading denominations are represented.

History. The name "California" was originally applied to what is now Lower California, which was visited by the Spanish as early as 1533. Later the name was extended to the whole western coast of North America below the parallel of 42°, and the distinction of Upper and Lower California was introduced. The first exploration within the limits of the State was done in 1542 and 1543, when Cabrillo visited the coast and islands of the Santa Barbara region. In 1579 Sir Francis Drake sailed as far as the forty-third degree of latitude, and named the country New Albion, but did not, as is generally supposed, enter the Bay of San Francisco. In 1602 and 1603 Vizcaino explored the bays of San Diego and Monterey and sailed as far north as Point Reyes. The Spanish attempted to civilize the country by the establishment of missions along the coast. In 1769 the first mission in California proper was erected at San Diego by the Franciscans, and by 1823, when the last and most northerly station had been planted at Sonoma, these religious houses had grown to 21 in number and acquired great wealth in olive, orange, and grape plantations and cattle and horse ranches. The Indians were early converted to Christianity, gradually weaned from their nomadic and barbaric state, and induced to lead a settled life. They were taught farming and other civilized pursuits and became in time a peaceful and industrious people. The Spanish government, which intended eventually to turn the mission estates into administrative districts, never acknowledged the title of the priests to the land and in 1777 began the founding of pueblos or towns. Upper California was divided into the four provinces of San Diego, Santa Barbara, Monterey, and San Francisco. After the Mexican Revolution of 1821 the missions began to decline. The Indians were partly emancipated in 1826, and the process of secularization, which began in 1833, was completed by 1845. Commerce with foreign nations, which was at first forbidden, became very large after 1822. In 1826 the first American immigrant wagon train entered California. In 1840 Monterey was made the capital, and a year later the Russians, who had maintained a trading post north of Bodega Bay since 1812, abandoned it.

Under the Mexican Republic California enjoyed virtual autonomy, and after 1840 its independence was seen to be inevitable. A silent

conflict arose between those who favored ultimate annexation to the United States and the large class of property owners who were inclined to favor the establishment of a British protectorate. In the southern part of the State Larkin, the United States Consul, was secretly endeavoring to stir up a revolt against Mexico and to bring about the extension of the jurisdiction of the United States over the country. But before his schemes had attained full maturity, a rising of the American settlers in northern California took place. On June 14, 1846, a small party of Americans, aided by John C. Frémont, who was then in California at the head of an exploring expedition, seized the town of Sonoma, raised the Bear Flag, and on the Fourth of July proclaimed the independence of California. Commodore Sloat, acting under orders from the United States government, which was then preparing to go to war with Mexico, seized Monterey and Yerba Buena (San Francisco), and the conquest of the country was completed by Commodore Stockton, Colonel Frémont, and General Kearny. On Aug. 15, 1846, California was declared a Territory of the United States.

The discovery of gold at Sutter's Mill, near Coloma, on Jan. 24, 1848, gave an impetus to immigration from all parts of the globe. The great body of gold seekers, "the Argonauts," arrived in 1849, and by the end of the year the population exceeded 100,000. Nearly all the newcomers were unmarried men, in haste to get rich. Hence the organization of an authoritative body, responsible for public order, was neglected or hindered by the influx of lawless characters. There ensued reckless speculation, extravagant living, and easy-going morality in many localities. Stable elements, however, were not wanting—the mining camps had stringent laws of their own, and lynch law was resorted to in many quarters. Life and property, however, were not well secured. The people were heavily taxed without representation, and though San Francisco had been made a port of entry, no Territorial government had been granted. On Nov. 13, 1849, after several unsuccessful attempts at State making, a constitution, in which slavery was prohibited, was adopted, and on Sept. 9, 1850, California entered the Union. (For national events connected with the State's admission, see UNITED STATES, and COMPROMISE MEASURES.) In 1851 the citizens of San Francisco formed a vigilance committee to check lawlessness in that city. The committee tried offenders, banished and hanged at its discretion, and performed its duties so efficiently that in 1856 it was reorganized to meet a new outburst of public disorder and official corruption. When the Civil War broke out, California, which was thought to be contemplating secession, was exempted from furnishing troops. The Union party, however, became dominant, contributed nearly \$1,500,000 to the Federal government, and sent five companies of volunteers into the field.

Since the Civil War California has experienced a magnificent economic development. The completion of the Union Pacific Railroad furthered the prosperity of the State. Both from the Eastern States and from across the Pacific the tide of immigration flowed in steadily. So considerable, indeed, did the number of Chinese immigrants become that between 1870 and 1890 the Chinese question dominated State politics and influenced national legislation. In the min-

ing districts the Chinese reworked abandoned placer claims. In urban and suburban communities they became laundrymen, truck gardeners, hucksters, and domestic servants or, in the "Chinatown" which became a feature of the larger cities, pursued more varied callings. Their stolid patience and their capacity for long and sustained toil made them in one way ideal laborers for the development of a new country; but their extreme frugality and their willingness to work for a small wage made them formidable competitors of white labor. (See CHINESE IMMIGRATION.) In 1878 and 1879 Denis Kearney (q.v.), a vociferous agitator, taking advantage of the discontent prevailing among the lower classes of San Francisco, owing chiefly to the question of Chinese immigration, organized the Workingmen's party, which for a short time controlled State politics and brought into being the present constitution of California, with its many radical features. The conflict between the mining and agricultural interests over the disposition of mining débris or "slickens" and the utilization of the natural water power of the State was removed in a great measure by prolonged and elaborate legislation on the subjects of mineral débris and drainage. In 1887 a comprehensive system of irrigation was begun, which has yielded great results. The California International Midwinter Exposition, held at San Francisco in 1894, served to illustrate the progress and prosperity of the State. On April 18, 1906, an earthquake rocked the coast of California. The business section of San Francisco was almost entirely destroyed by the shock and by the fire, which broke out shortly after, and San José, Santa Rosa, and other coast towns were materially injured. (See SAN FRANCISCO EARTHQUAKE.) Before 1860 California was Democratic in national politics. Since that date it has been Republican, with the exception of the years 1880 and 1892. In State elections California has changed from Democratic to Republican repeatedly on local issues.

The hostility towards Orientals, which resulted in the passage of the Chinese Exclusion Act of 1881 (see CHINESE IMMIGRATION), manifested itself in attempts to limit the rights of the Japanese in 1906, 1909, and again in 1913. In the early years of the twentieth century large numbers of Japanese immigrated into California, where their presence soon came to be regarded as a menace, especially by organized labor. (See ORIENTAL EMIGRATION.) This feeling vented itself in a series of riots and outrages against the Japanese in San Francisco and other coast cities of California.

In consequence of the general anti-Japanese agitation, the school board of San Francisco, in October, 1906, passed an order excluding children of Japanese parents from the schools. The Japanese government protested to the government of the United States, on the ground that the rights guaranteed to its citizens by treaties with the United States had been violated. Under pressure from Washington the San Francisco school board rescinded its action, and an agreement was effected between the United States and Japan by the terms of which the latter country undertook to restrict the further emigration to the United States of Japanese laborers. In 1909 the anti-Japanese agitation was revived by rumors, more or less well founded, of a wide extension of Japanese control over the fruit and garden lands of the

State. Bills restricting the right of Orientals to own land were introduced in the Legislature in 1909 and would have become law but for pressure exerted by the Federal government. Again in 1913 drastic bills were introduced in both houses of the California Legislature, restricting the power of holding land of aliens, and of corporations of which a majority stock was held by aliens.

The Japanese government made strong protest to President Wilson against these measures. President Wilson, as a result of these protests, urged the California Legislature to amend the alien ownership bill so that they would apply to all aliens and not particularly to the Japanese. In addition to sending messages to the Governor and presiding officers of the two houses, he directed the Secretary of State to go to California for the purpose of conferring with Governor Johnson and the Legislature in regard to the proposed antialien laws. The two houses of the Legislature dropped the previous bills and gave their attention to a new bill which was framed by the Attorney-General of the State. The first provision of this bill is as follows: "All aliens eligible to citizenship under the laws of the United States may acquire, possess, enjoy, transfer, and inherit real property or any interest therein in this State in the same manner and to the same extent as citizens of the United States, except as otherwise provided by the laws of this State." The second provision provided that "all aliens other than those mentioned in section one may acquire, possess, enjoy, and transfer real property or any interest therein, in the manner and to the extent, and for the purpose prescribed by any treaty now existing between the government of the United States and the nation and country of which such alien is a citizen or subject, and not otherwise." It was held by the advocates of this bill, that, as it specifically guarded treaty rights and also affirmatively conferred rights on all aliens eligible to citizenship instead of debarring from existing rights those ineligible, it was free from objection or offense. This bill passed both houses of the Legislature on May 3, 1913, and was signed by Governor Johnson on May 18. See UNITED STATES, *History*.

The struggles of San Francisco to free itself from the domination of corrupt officials in the first decade of the twentieth century acquired national interest and importance. In 1902 rumors were circulated of a corrupt alliance between Mayor Eugene F. Schmitz, who had been elected in 1900 on a Labor ticket, and the notorious politician Abraham Ruef. In spite of these rumors Schmitz was reelected for two successive terms; but in 1905 Rudolph Spreckels provided \$100,000 to carry on an investigation of the charges. The investigation was conducted by F. J. Heney and W. J. Burns, then a detective in the employ of the United States government. After many months of secret investigation, enough evidence was found to indict Ruef and Schmitz on the charge of extortion, and on May 9, 1907, they were arrested. Four days later 17 city supervisors confessed to Mr. Burns that they had received bribes from the United Railways Company to grant a new franchise to the company. Other indictments were found against officials of the street railways and other corporations. Ruef pleaded guilty to the charges of extortion, and Schmitz, on trial, was convicted. On June 30 Schmitz was indicted for bribery

on 40 counts, and Ruef on 126. On November 5 an election for mayor was held, and so deeply had these investigations and their results stirred the people that Dr. Edward R. Taylor, a candidate of the Citizens' Reform ticket, was elected. On Jan. 9, 1908, the Supreme Court of the State set aside the verdict against Schmitz on a technicality. The same decision released Ruef from the charge of extortion. In the same month Ruef was put on trial for bribery. The jury disagreed, and he was released on bail of \$1,500,000. He was again brought to trial on Aug. 19, 1908. On November 13 Mr. Heney, who was conducting the prosecution, was shot while in the court room. The wound proved not serious, and the trial was continued. Ruef was found guilty on December 29 and was sentenced to 14 years' imprisonment. Schmitz was not brought to trial again, and the indictments against him were dismissed.

In the presidential election of 1908 Taft received 214,398 votes in California, and Bryan, 127,492. The elections of 1910 were conducted in accordance with a new primary law which went into effect that year. The insurgent or progressive element in the Republican party had gained great strength and was able in the Republican Convention to force the nomination of Hiram W. Johnson, a prominent lawyer who had taken an active part in the Ruef prosecution in San Francisco. Mr. Johnson was elected with the whole Republican State ticket. In the election held on Oct. 10, 1911, 21 amendments to the constitution were submitted to the voters. These included amendments for woman suffrage, for the initiative and referendum, and for the recall, including the recall of judges. They were all carried. The initiative and referendum received a majority of about 60,000, the recall about 100,000, and woman suffrage about 3000.

California was especially conspicuous in the presidential campaign of 1912. Governor Johnson was one of the most aggressive supporters of President Roosevelt and was nominated for the vice presidency on the national Progressive ticket. A presidential primary election was held in the State on May 14, in which Roosevelt received 183,563 votes, Taft 69,345, and LaFollette 45,876. Champ Clark received a large plurality of the Democratic votes. On October 3 the State Supreme Court by its interpretation of the primary law barred from the Republican ticket the electors pledged to Mr. Taft. The result of the elections showed 283,605 votes for Roosevelt, 283,444 for Wilson, 69,869 for Debs, 3943 for Taft. As two Roosevelt electors received fewer votes than Wilson electors, the electoral vote of the State was divided so that Roosevelt received 11 and Wilson 2.

The following is a list of Governors of the State:

MILITARY AND PROVISIONAL GOVERNORS

Col. Robert F. Stockton.....	1846-47
Col. John C. Frémont.....	1847
Gen. S. W. Kearny.....	1847
Col. R. B. Mason.....	1847-49
Gen. Persifer F. Smith.....	1849
Gen. Bennet Riley.....	1849

STATE GOVERNORS

Peter H. Burnett.....	Democrat.....	1849-51
John McDougall.....	".....	1851-52
John Bigler.....	".....	1852-56
J. N. Johnson.....	Know-Nothing.....	1856-58
John B. Weller.....	Democrat.....	1858-60
Milton S. Latham.....	".....	1860
John G. Downey.....	".....	1860-61

Leland Stanford.....	Republican.....	1861-63
Frederick F. Low.....	".....	1863-67
Henry H. Haight.....	Democrat.....	1867-71
Newton Booth.....	Republican.....	1871-75
Romualdo Pacheco.....	".....	1875
William Irwin.....	Democrat.....	1875-79
George C. Perkins.....	Republican.....	1879-83
George Stoneman.....	Democrat.....	1883-87
Washington Bartlett.....	".....	1887
R. W. Waterman.....	Republican.....	1887-91
H. H. Markham.....	".....	1891-95
J. H. Budd.....	Democrat.....	1895-99
Henry T. Gage.....	Republican.....	1899-1903
George C. Pardee.....	".....	1903-07
James N. Gillett.....	".....	1907-11
Hiram W. Johnson.....	Progressive.....	1911-17
W. D. Stephens.....	Republican.....	1917-

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CALIFORNIA, GULF OF. An arm of the Pacific, separating the peninsula of Lower California from the rest of Mexico (Map: Mexico, C 4). It was originally known as the Sea of Cortés, having been discovered under his auspices and explored by himself. It is 700 miles in length, and varies in width from 30 to nearly 150 miles. It receives at its upper end the Colorado, and from the east several streams, chief of which are the Altar, Sonora, Yaqui, Mayo, and Fuerte. Both shores are bordered by highlands broken by the river valleys on the east, but on the west presenting an almost unbroken mountain wall. The coast line is irregular and forms numerous small bays. The gulf has a depth ranging from 600 feet near the head to over 6000 feet near its mouth, and contains many islands, particularly in the upper part, the largest of which are Ángel de la Guarda and Tiburón. On its west shores are the ports of San Felipe, San José, and La Paz; on its eastern, those of Mazatlan and Guaymas. There are pearl fisheries on the west coast.

CALIFORNIA, LOWER, or OLD (Sp. *Baja* or *Tieja California*). A peninsula in southwest North America, forming a territory of Mexico. It extends from about lat. 22° 40' to 32° 40' N. It is bounded by California on the north, the Pacific on the west, and the Gulf of California and the Mexican State of Sonora on the east. Its total length is over 750 miles, while its width varies from about 30 to 140 miles. Area, 58,343 square miles. The surface is generally mountainous, the peninsula being practically an extension of the Sierra Nevada and Coast Range region. At the centre is a plateau region interrupted by mountain peaks and short ranges, Santa Catalina, in the northern central part, attaining an altitude of over 10,000 feet. An eastern coast range borders the Gulf of California, and in places attains elevations consider-

ably exceeding 6000 feet. The western coast range, bordering the Pacific, is less elevated and seldom exceeds 3500 feet in altitude. At the extreme south the peninsula terminates in an immense mountain mass, rising in San Lázaro to 8000 feet altitude. The coasts are considerably indented, but there are not many really good harbors. The principal islands are Ángel de la Guarda, off the central eastern coast, and Cedros (Cerro), off the opposite western coast. Numerous smaller islands are scattered along the southeastern coast, and a few long, narrow islands fringe the southwestern coast. The climate and vegetation of the western portion resemble those of southern California. The climate is dry and warm, the rainfall in most of the region ranging from under 10 to 25 inches, which with a high temperature is a small amount. Few streams occur of any importance except as irrigators, and these are most numerous in the southwest. In the southern part are considerable areas of uninhabitable land. The largest and most important cities are La Paz (q.v.) and Ensenada de Todos Santos. Pop., 1895, 42,245; 1900, 47,624; 1910, 52,244.

CALIFORNIA, UNIVERSITY OF. A State University for higher education at Berkeley, Cal. The university was established in 1868, under the general provision for agricultural colleges made by the Congressional Act of 1862, which united with it the College of California, chartered in 1860. Instruction was begun in Oakland in 1869, and the university was transferred to its present location in 1873. The government is vested in the regents of the University of California, a corporation, consisting of the higher State officers, the presidents of the University of California, of the State Agricultural Society, and of the Mechanics' Institute of San Francisco, all acting as members ex officio, and of 16 other members appointed by the governor of the State for 16 years, two appointments expiring every second year. The university is a State institution, receiving various State appropriations for specific purposes. From year to year the university receives about two-thirds of its income from the State, and the balance from gifts, or from the income of former gifts, from the United States, from student fees, and from miscellaneous sources.

The university comprises the following departments of instruction: in Berkeley, the colleges of Letters, Social Sciences, Natural Sciences, Commerce, Agriculture, Mechanics, Mining, Civil Engineering, and Chemistry; the schools of Architecture, Jurisprudence, and Education, and the University Extension Division; on Mount Hamilton in Santa Clara County, the Lick Astronomical Department; in San Francisco, the California School of Design, Hastings College of the Law, College of Medicine, George Williams Hooper School for Medical Research, endowed with nearly \$2,000,000 for the exclusive purpose of medical investigation; College of Dentistry, California College of Pharmacy; in La Jolla, near San Diego, Cal., the Scripps Institution for Biological Research; in Riverside, Cal., the Graduate School of Tropical Agriculture; at Davis, Cal., the University Farm; in Santiago, Chile, the D. O. Mills Observatory (a branch of the Lick Observatory). The College of Medicine was organized in 1873 by the absorption of the Toland Medical College. The College of Dentistry was organized in 1888. The Lick Observatory on Mount Hamilton was

founded in 1875 by James Lick, who devoted \$700,000 to the purpose, among other things, of constructing "a telescope superior to and more powerful than any telescope ever made." The Department of Anthropology, organized primarily for research, has conducted excavations in Egypt, Peru, and North America, and pursues linguistic and ethnological investigations. It has published a dozen volumes on American ethnology and linguistics.

The University of California makes no charge to students resident in California for courses in the colleges of Letters, Social Sciences, Natural Sciences, Commerce, Agriculture, Mechanics, Mining, Civil Engineering, and Chemistry. The instruction in all the colleges is open to properly qualified persons, without distinction of sex. Students not residents of the State are charged a nominal fee for tuition. Since 1888, when its total student body numbered only 306, the university has grown very rapidly. For the year 1912-13 there were 7296 students enrolled in the University of California, of whom 4094 were academic undergraduates, 648 graduate students, 315 in the colleges of Law, Medicine, Dentistry, and Pharmacy, 191 University Farm, 294 San Francisco Institute of Art, 2275 Summer Session of 1912; 521 double registrations, to be deducted. The registration of academic undergraduates was distributed as follows: Letters 176, Social Sciences 1306, Natural Sciences 1077, Commerce 287, Agriculture 455, Mechanics 318, Mining 132, Civil Engineering 224, Chemistry 60, Medicine 59. Of the 648 graduate students 528 were enrolled in the colleges of Letters, Social Sciences, and Natural Sciences. At the same time there were 719 professors, instructors, lecturers, assistants, and administrative officers, of whom 460 were in the academic department. Omitting the summer session, approximately one-third were women. A relatively large proportion of the students pursue the general academic courses as compared with the technical or professional courses. The steady increase in registration in the College of Agriculture is also to be noted. Of the 1913-14 intrants in the academic colleges, 20 per cent entered from colleges or secondary schools outside the State; and of the 1580 such intrants, one in five entered with advanced standing.

Since the university possesses the liberally endowed research institutions for astronomy, biology, preventive medicine, agriculture, etc., and since research is regarded as one of the chief functions of the institution, its scientific publications have become of importance. They aggregate several thousand pages yearly. The University Press issues scientific series in some 30 different fields.

The university is beautifully situated on the lower slopes of the Berkeley Hills, overlooking San Francisco Bay and the Golden Gate. The site comprises about 270 acres of land, rising at first in a gentle, and then in a bolder slope from a height of 200 feet above sea level to one of over 900 feet. East of the campus, the chain of hills continues to rise 1000 feet higher.

A permanent plan for the development of the grounds and buildings was secured through the aid of Mrs. Phoebe A. Hearst, for many years a regent of the university. The plan designed by M. Emile Bénard of Paris, winner of an international competition (judged at Antwerp in 1898, and finally decided by vote of the jury in San Francisco in 1899), as developed by Mr.

John Galen Howard, professor of architecture in the university and supervising architect, recognizes the possibilities of the site and gives the amplest scope for the development of the university. The first buildings erected under the permanent plan have been the Hearst Memorial Mining Building, costing \$644,000; California Hall, a building costing \$270,000 and sheltering the administrative offices and the departments of history and economics; the University Library, given by Charles Franklin Doe, costing, including equipment, \$882,000; Agriculture Hall, \$200,000; Boalt Hall of Law, costing \$160,000; the Peder Salther Gateway, \$36,000; and the Jane K. Salther Campanile, a 300-foot granite bell tower, costing \$200,000, and containing the Salther Bells, a set of chimes for which \$25,000 was given by Mrs. Jane K. Salther; and the Greek Theatre, an open-air auditorium seating 8000 people.

The value of the buildings and grounds belonging to the University of California in 1913 was \$7,886,000. Its endowment funds aggregate \$5,570,000, and its total income derived from all sources was for the year ending June 30, 1913 (omitting moneys received for endowment or for buildings), \$1,730,000.

At the end of the year 1913 the library contained 300,000 volumes, and this is increasing by more than 20,000 volumes per annum. The library possesses also several hundred thousand manuscripts, which constitute the most important primary material extant for the history of California and the Pacific coast of the United States.

The presidents of the university have been Henry Durant, Daniel C. Gilman, John LeConte, W. T. Reid, E. S. Holden, Horace Davis, Martin Kellogg, and Benjamin Ide Wheeler, Ph.D., LL.D., formerly professor of Greek and comparative philology in Cornell University, who became president in 1899.

CALIFORNIA POPPY. See *ESCHSCHOLTZIA*.

CALIGA (Lat.). A strong sandal-like shoe, worn by private soldiers and by the centurion in the Roman army. It was secured to the foot by straps. Its sole was thickly studded with hobnails. See also *CALIGULA*.

CALIG'ULA. A tragedy by John Crowne, published in 1693 with a dedication to the Earl of Romney and written in rhymed heroics.

CALIGULA, BRIDGE OF. A so-called bridge of wood prepared by Caligula to facilitate his passage from his palace on the Palatine Hill to the Temple of Jupiter on the Capitol. It crossed the Forum valley, using the Temple of Augustus and the Basilica Julia as piers.

CALIGULA, GAIVS CÆSAR AVGVSTVS GERMANICVS (12-41 A.D.). Emperor of Rome from 37 to 41. He was the youngest son of Germanicus (nephew of Tiberius) by Agrippina, and was born Aug. 31, 12, at Antium, and was educated in the camp, in Germany, where the soldiers gave him the nickname Caligula, from the military shoes (*caligæ*) which he wore. On the death of his brother Drusus he was made augur in his stead. On the death of Tiberius (37), who, it was suspected, had received foul play at his hands, it was found that he had been appointed coheir along with the grandson of Tiberius, called Tiberius Gemellus, but the Senate and the people allowed Caligula supreme and sole authority. In the beginning of his reign he appeared hardly likely to fulfill the threat of Tiberius, who had talked of educating

Caligula "for the destruction of the Roman people." He seemed lavishly generous and merciful, pardoning even those who had been the instruments of cruelty against his own family. But this ostentatious magnanimity was itself a disease, an unwholesome affectation, founded on no principle, or even humanity of heart, and coexisted with the most savage voluptuousness and lust. Consequently, when, after he had ruled eight months, illness, the result of his vicious life, had weakened his faculties, the lower qualities of his nature obtained the complete mastery. In addition to the senseless prodigality with which he commenced his career—he expended in one year the enormous wealth left by Tiberius, 720,000,000 sesterces—he began to manifest the most barbarous propensities. He banished or murdered his relatives, except his uncle Claudius and his sister Drusilla; filled Rome with executions, confiscating the estates of his victims; amused himself, while dining, by having victims tortured and slain in his presence; and uttered the wish "that all the Roman people had but one neck, that he might decapitate Rome at a blow!" To vie with Xerxes, he made a bridge of ships over the bay between Baia and Puteoli (a distance of 3 Roman miles and 600 paces), and celebrated the exploit by a costly banquet on the middle of the bridge, and by collecting on it great numbers of people and causing them to be drowned. His favorite horse was stabled in a palace, fed at a marble manger, was made a member of the college of priests, and afterward raised to the consulship. As a climax to all his absurdities, he declared himself a god, and had temples erected and sacrifices offered to himself. At length a conspiracy was formed by the officers of his guards, and he was assassinated, 41 A.D. His life is told by Suetonius. Consult also Baring-Gould, *The Tragedy of the Cæsars* (London, 1892). See *CHLÆREA*.

CALIGULA, PALACE OF. The residence of Caligula on the Palatine Hill overlooking the Forum. The palace was an extension, on the north, of the Palace of Tiberius. The superstructure has entirely disappeared, and the existing ruins over the Via Nova, long ascribed to the Palace of Caligula, are now regarded as belonging rather to the second and the third centuries. A cryptoporticus, about 140 meters long, led from the structures of Caligula along the east side of Tiberius' palace to the House of Livia, and, by a branch, to the House of Augustus. In this Caligula is said to have been murdered.

CALINGA, kâ-lên'gâ. See *KALINGA*.

CALIPERS (corrupted from *calibre*; see *CALIBRE*). An instrument for measuring the diameter or thickness of objects. If a pair of ordinary dividers have its legs curved into bows and be applied to an object so that the extreme points of the diverging legs embrace it, the distance between the points of the two legs will be the exact thickness of the object, and this distance can be determined in the usual units of length by applying the points to a scale and reading off the space subtended by them. This is the simplest form of calipers. If the dividers have a graduated arc attached, so arranged that it records exactly the distance apart of the points of the legs, we then have a registering calipers. Calipers of this general form are made in a variety of shapes and with a variety of registering and adjusting devices for special

purposes. The curving or bowing of the legs is done so that the measuring may be made at the maximum or meridian section of a cylindrical piece without errors that would arise from the angular relation of the two legs if these were

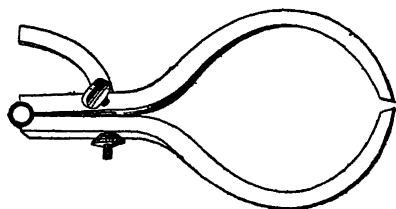


FIG. 1. SIMPLE CALIPERS.

straight and pivoted together. If the two legs are not in the same plane but made to pass each other, the caliper may be used to measure the inside diameter of holes or other openings. Calipers are therefore "outside" calipers, as in the illustration (Fig. 1), or "inside" calipers for the other use. Fig. 3 may be used for both outside and inside measurements. Fig. 1 shows a form of calipers for rough measurements, such as measuring the diameter of rolled rods or the thickness of rolled plates. Fig. 2 shows a form

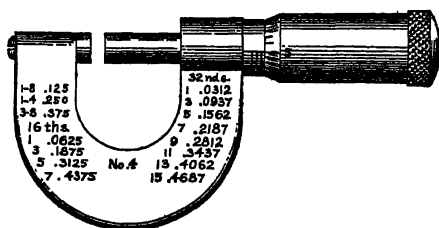


FIG. 2. MICROMETER CALIPERS.

of calipers, known as micrometer calipers, for very precise measurements. The mechanical principle embodied in the construction is that of a screw of known pitch, advancing in a fixed nut. An opening to receive the work to be measured is afforded by the backward movement of the screw, and the size of the opening is indicated by the graduations. The pitch of the screw, or distance between its threads, is 40 to the inch in this particular calipers, and the graduations on the barrel are forty to the inch, and are figured 0, 1, 2, etc., at every fourth division. As these graduations conform to the pitch of the screw, each division equals the longitudinal distance traversed by the screw in one complete

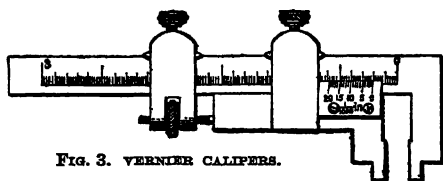


FIG. 3. VERNIER CALIPERS.

revolution, and shows that the calipers has been opened $\frac{1}{40}$ or $\frac{1}{1000}$ of an inch. The beveled edge of the thimble is graduated into 25 parts and is figured at every fifth division, 0, 5, 10, 15, 20, etc. Each division when coincident with the base line of the divisions on the barrel indicates that the gauge screw has made $\frac{1}{25}$ of a revolution.

and that the opening of the calipers has increased $\frac{1}{25}$ of $\frac{1}{1000}$ or $\frac{1}{25000}$ of an inch. Hence, to read the calipers, multiply the number of divisions visible on the scale of the barrel by 25, and add the number of divisions on the scale of the thimble from zero to the line coincident with the base line of the graduations on the barrel. For example, as the calipers is set in the illustration, there are three whole divisions visible on the barrel. Multiplying this number by 25 and adding 5, the number of divisions registered on the scale of the thimble, the result is $\frac{1}{1000}$ of an inch. There are also special forms of micrometer calipers for the accurate measurement of V-threads on screws, bolts, etc., and calipers for measuring the depths and thickness of gear teeth and other purposes. A common form of calipers, known as vernier calipers, is shown by Fig. 3, where the opening is read by a fixed scale to the nearest fortieth of an inch, and the finer dimension of the balance by the vernier which gives readings to $\frac{1}{200}$ of $\frac{1}{40}$, or $\frac{1}{8000}$ of an inch. See **VERNIER**; **GAUGE**.

CALIPH (Fr. *calife*, Ar. *khalifa*, successor, from *khalafa*, to succeed). The title of Mohammed's successors in temporal and spiritual power, from which the early Empire of Islam is known as the caliphate. While the first impulse of conquest given to the Arabs by the new faith endured, the power of the caliphs was vast, covering the whole world of Islam; but with time the usual consequence followed the combining of spiritual authority with temporal dominion. The caliphate became the subject of factional strife and a prize for ambitious leaders, and rival dynasties broke Islam up into independent powers united only in enmity to the unbeliever. The first four caliphs (632-661), Abu Bekr, Omar, Othman, and Ali, were generally recognized as true successors to the spiritual authority of the Prophet, all being members of his immediate family, though under Ali, who was assassinated, there were insurrectionary movements. The Ommyads (661-750) held a more doubtful title, but still one that was recognized. With the accession of the Abbassides the Mohammedan world was divided, a survivor of the Ommyads founding in Spain the emirate (later caliphate) of Córdoba. This was never a true caliphate according to Mohammedan law, but it was one of the greatest in wealth and civilization of all the Mohammedan empires. The Abbasside dynasty saw other rivals arise, the Aglabites and Edrisites in Africa, as well as minor claimants. It was the story of the feudal world everywhere—emirs seizing sovereign power whenever the opportunity offered. From the tenth century on, the Abbasside caliphs were mere creatures of the powerful Turkish guards, rashly organized by the Caliph Motassem (833-842). In 1258 another Motassem, the last Abbasside caliph, was put to death by Hulaku Khan. (See **MONGOL DYNASTIES**; **PERSIA**.) Nominal successors of the caliphs performed the spiritual functions of the office in Egypt as late as the sixteenth century, when the Turkish sultans reunited the spiritual and temporal headship of Islam in their own persons. There was a Shiite (q.v.) caliphate instituted in Persia in 1502. The first four caliphs had their capital at Medina; the 14 Asiatic Ommyads made Damascus their seat of power; while Bagdad was that of the 37 Abbassides. There was also established at Cairo in Egypt (909-1171) a dissenting caliphate, that of the Fatimites.

Twenty-two Ommyads (756-1031) of the Spanish line ruled in Córdoba. (See **ABBASSIDES**; **FATIMITES**; **OMMYADS**; and separate articles on the greater caliphs.) Consult also: Sir William Muir, *Annals of the Early Caliphate* (London, 1883), and *The Caliphate: Its Rise, Decline, and Fall* (London, 1891), an abridgment of the *Annals*, with a continuation to the fall of the Abbassides; Weil, *Geschichte der Chalifen* (5 vols., Mannheim and Stuttgart, 1846-62); Syed Ameer Ali, *A Short History of the Saracens* (New York, 1899); S. Lane Poole, *The Mohammedan Dynasties* (London, 1894).

CALIPPIC CYCLE. See **PERIOD**.

CALISA'YA BARK. See **CINCHONA**.

CALISTA. 1. The vengeful wife of Alaric and mistress of the "gay" Lothario, in Rowe's *Fair Penitent*. The rôle was a great favorite with eighteenth-century actresses. 2. The wife of Cleander in Massinger and Fletcher's *Lover's Progress*. She is possessed of an intense passion for Lysander, but still remains true to her husband. The character was largely suggested by Caliste, in Daudiguiet's *Lysandre et Caliste*. 3. The lady in waiting and confidante of Queen Berengaria, in Scott's *Talisman*. She assists in a silly and dangerous trick against Sir Kenneth, by which he is lured away from guarding the royal standard.

CALISTHENICS. See **GYMNASTICS**.

CALIVER (from Fr. *calibre*, calibre, bore; see **CALIBRE**). A matchlock or firearm about midway in size and character between an arquebus and a musket, and small enough to be fired without a rest or support. It could be discharged much more rapidly than a musket, but did not do so much execution. It was introduced in the sixteenth century and received its name from the fact that the bore was of uniform *calibre*, so that the common stock of bullets for a company might fit all weapons.

CALIXTINES, *ká-lik's'tinz*. A name given (1) to the conservative wing of the Hussites (q.v.) (from Lat. *calix*, cup, chalice), because they contended for lay communion in both kinds; (2) to the followers of Georg Calixtus (q.v.) in the latter half of the seventeenth century.

CALIXTUS. A name borne by three Popes.—**CALIXTUS I.** Bishop of Rome from 219 to 223 (or 517 to 522). He was born a slave.—**CALIXTUS II.** Guido of Vienne. Pope from 1119 to 1124. He was a son of the Count of Burgundy. He expelled the Antipope Gregory from Rome in 1120, stormed the castle in which he took refuge, and made him a prisoner. He concluded with Henry V of Germany the famous Concordat of Worms (1122), by which the long dispute over the question of investiture (q.v.) was adjusted.—**CALIXTUS III.** Alonzo de Borja or Borgia. Pope from 1455 to 1458. His leading idea was to institute a great crusade against the Turks, in which he failed. He was the uncle and patron of Rodrigo Borgia, afterward Pope Alexander VI.

CALIXTUS, GEORG (1586-1656). A German Lutheran theologian. He was born at Medelbye in Schleswig and studied at Flensburg and Helmstedt. After traveling as an earnest student for four years in Germany, Holland, England, and France, where he made the acquaintance of the most learned men of his time, he returned to Helmstedt in 1613, and in the following year was appointed professor of theology. His genius, the depth of his knowledge, and his large

experience of the world and of men, which he had acquired in his travels, developed in him a spirit of great tolerance towards all who held their religious opinions honestly, whatever these might be.

Although his dissertations on the Holy Scripture, transubstantiation, communion in one kind, etc., are acknowledged by learned Catholics to be the most solid and admirable which have been composed by Protestants against the distinctive doctrines of Catholicism, he was, on account of some statements in his work entitled *De Præcipuis Religionis Christianæ Capitibus*, which seemed favorable to Catholic dogmas, and of others in his *Epitome Theologia Moralis*, *De Tolerantia Reformatorum*, etc., which approached too near to the Reformed or Calvinistic standpoint, declared guilty of abominable heresy by the adherents of the letter of the Concordien-formel—i.e., the orthodox and dogmatically rigid Lutherans. Calixtus felt keenly that the polemical harshness of Lutheranism was a serious obstacle in the way of a great Catholic Christianity, and that Protestantism must assume another form before it could hope to become the religion of Europe. Under this conviction Calixtus endeavored to show that the oldest and most fundamental articles of the Christian faith—viz., the facts embodied in the "Apostles' Creed"—were common to all Christian sects. In subsequent dissertations, having stated that the doctrine of the Trinity was less distinctly taught in the Old than in the New Testament, and that good works were necessary to salvation, and finally, at the religious conference of Thorn in 1645, whither he was sent as a mediator by the Elector of Brandenburg, having been on more intimate terms with the Calvinistic than the Lutheran theologians, Calixtus was accused of apostasy. Fortunately, however, he had powerful friends, who stood firmly by him, and through their help he was enabled to retain his professorial chair till his death in Helmstedt, on March 19, 1656. The discussion which arose over his position was known as the syncretistic controversy. For his biography, consult: E. L. W. Henke, *Calixt und seine Zeit* (Halle, 1853-56); W. C. Dowling, *German Theology during the Thirty Years' War; The Life and Correspondence of G. Calixtus* (London, 1863).

CALKING, kăk'ing (probably OF. *cauquer*, to tread, from Lat. *calcare*, to tread in, from *calx*, heel). This word is also very commonly mispronounced as though it were spelled corking. A process in which oakum is forced into the seams between the planks of a deck or the sides of a wooden ship in order to prevent the entrance of water. After the seams are spread, as much oakum is forced in as possible until they are nearly filled. They are then payed (i.e., filled up) with pitch, cement, or putty. Special chisel-shaped tools are used in calking, called *calking irons*, *making irons*, *raising irons*, and *reeming irons*. The edges of iron plates are also made water-tight by calking. In the case of flush edges or butts the calking tool commonly straddles the seam; but when one plate laps another its edge is driven down by the tool against the under plate.

CAL/KINS, FRANKLIN WELLES (1857-). An American writer, born in Iowa Co., Wis. He received a public-school and collegiate education, and educated himself in languages and literature. For three years he read law and was for a short time engaged in practice. He was successively a lawyer, contractor, real-estate

broker, and ranchman. In 1865 he removed to the extreme northwest frontier and was one of the early explorers of the Black Hills country. He visited many Indian tribes and became familiar with a number of Indian languages, and with animal and bird life in the plains and mountains. Among his writings are: *Frontier Sketches* (1893); *Indian Tales* (1893); *Hunting Stories* (1893); *Cougar-Tamer* (1899); *My Host the Enemy* (1901); *Two Wilderness Voyagers* (1902); *The Wooing of Tokala* (1907). His contributions to *The Youth's Companion* extend over more than a quarter century.

CALKINS, GARY NATHAN (1869-). An American zoölogist, born at Valparaiso, Ind. He was educated at the Massachusetts Institute of Technology and at Columbia University, where he was instructor in zoölogy in 1890-1903, adjunct professor in 1903-04, and professor of invertebrate zoölogy in 1904-06. In the latter year he became professor of protozoölogy. He is author of "The Protozoa," vol. vi, *Columbia University Biological Series* (1901), and *Protozoölogy* (1908).

CALKINS, MARY WHITON (1863-). An American educator, born at Hartford, Conn. Educated at Smith College and at Clark and Harvard universities, she became instructor in 1891 and later professor of philosophy and psychology at Wellesley College. Besides several monographs she is author of *Introduction to Psychology* (1901; 1905); *Der Doppelte Standpunkt in der Psychologie* (1905); *The Persistent Problems of Philosophy* (1907; 3d ed., 1912); *A First Book in Psychology* (1909; 2d ed., 1911).

CALKINS, RAYMOND (1869-). An American Congregational clergyman, born in Buffalo, N. Y. He graduated at Harvard in 1890, taught in Belmont, Cal., and in Iowa (now Grinnell) College, and then was instructor in German at Harvard and studied at the Harvard Divinity School in 1893-95. Ordained in 1896, he was assistant pastor of the First Church of Christ, Pittsfield, Mass., pastor of the Pilgrim Memorial Church of Pittsfield, of the State Street Church of Portland, Me., from 1903 to 1912, and subsequently of the First Church in Cambridge, Mass. He was prominent in the National Councils of the Congregational Church, wrote *Substitutes for the Saloon* (1901), and was one of the editors of *Hymns of the Church* (1912).

CALL. A term often used in reference to various theological and ecclesiastical subjects. 1. The command or invitation to believe in Jesus Christ is designated the *call of God*, or the *Gospel call*. Calvinistic theologians make a distinction between a *general call* and a *special* or *effectual call*; the former addressed to all to whom the word of God comes; but requiring for its efficacy to be accompanied by the special and irresistible grace of the Holy Spirit. They are careful, however, to state that the general or outward calling by the word always precedes and accompanies the special and effectual calling of the Spirit. The notion of an inward call by the Spirit of God in the soul, unconnected with outward calling by the word, belongs not to Calvinistic, but to mystic theology. 2. A call to office in the Church, and particularly to the ministry of the Gospel, is regarded by Christians generally as proceeding from God; and the Church of England requires of candidates for ordination an express profession that they trust they are

so moved of the Holy Ghost. Connected with this use is the wider application to any "vocation" or "calling." 3. A call by a local church to a minister whom it invites to its pastorate. In established churches, as the Church of England, the matter has been complicated by patronage rights. In Scotland the question has given rise to some of the principal ecclesiastical divisions. In America almost all denominations professedly give the call of the minister entirely into the hands of the local church or congregation; and where not professedly, it is still actually so placed in most bodies, and the tendency is every day stronger towards the complete autonomy of the local body in this matter. See PRESBYTERIANISM; CONGREGATIONALISM; METHODISM; CHURCH.

CALL. When subscriptions to a joint-stock enterprise do not require payment at once of the full amount of shares, it is frequently provided that a certain proportion shall be paid in cash, the remainder being subject to call upon the part of the management. The term "call" is also applied to the amount of these delayed payments. See STOCK EXCHANGE.

CALL, EDWARD PAYSON (1855-1919). An American newspaper publisher, born at West Cambridge, Mass. From 1884 to 1897 he was successively advertising manager of the *Boston Herald*, the Royal Baking Powder Company, and the *Philadelphia Press*. Taking up journalism in the city of New York, he published the *Evening Post* in 1897-1902, the *Mail and Express* in 1902-04, and the *Commercial* in 1904-07, and in 1909 became assistant business manager of the *New York Times*.

CALL, WILKINSON (1834-1910). An American lawyer and Democratic politician. He was born in Russellville, Ky., but early in life went to Florida, where he became a lawyer. In the Civil War he rose to the rank of adjutant general in the Confederate army. He was elected to the United States Senate in 1865, but was not permitted to take his seat. In 1879 he was again elected and served continuously until 1897.

CALLA (Lat., an uncertain plant). A genus of plants of the family Araceæ. The genus *Calla* is characterized by a flattened spathe within which is a cylindrical spadix covered with naked flowers, appearing as a mere mixture of stamens and pistils. The only species, *Calla palustris* (water arum), is found in cold bogs in Europe, Siberia, and North America, but not in Great Britain. It has a creeping rootstock, and heart-shaped, stalked leaves, prolonged into a point; the spathe is white, and the spadix yellow. The rootstock is extremely acid; but, being deprived of its acidity by grinding, boiling, and macerating, is made by the Laplanders into a kind of bread called *missebroed*, which they hold in high estimation. The well-known and beautiful calla lily (*Richardia æthiopica*) was formerly included in this genus.

CALLAHAN, JAMES MORTON (1864-). An American educator and author, born at Bedford, Ind. He was educated at Indiana and Johns Hopkins universities and at the University of Chicago. In 1897-98 he was professor of American history and constitutional law at Hamilton College. In 1898 he became lecturer at Johns Hopkins and in 1900 had charge of the bureau of historical research at Washington. He was appointed professor of history and political science at the West Virginia University

in 1902. His publications include: *Neutrality of the American Lakes* (1898); *Cuba and International Relations* (1899); *American Relations in the Pacific and the Far East* (1901); *Confederate Diplomacy* (1901); *An Introduction to the American Expansion Policy* (1908); *Evolution of Seward's Mexican Policy* (1909).

CALLAO, ká-lyá'ò (Sp. cala, creek, bay, from Celt. cala, harbor). The principal seaport of Peru and the capital of a small province of the same name; situated on Callao Bay, 7 miles west of Lima, with which it is connected by rail (Map: Peru, B 6). The modern city, a short distance to the north of the original town which was destroyed by earthquake and tidal wave in 1746, is divided into two sections, the older occupying the centre and having narrow and crooked streets, while the surrounding portion is well laid out with broad avenues crossing at right angles. The buildings of the city are not particularly notable from an architectural standpoint. The climate is temperate, but the city is unsanitary and fever-stricken. The harbor, though an open roadstead, is safe and spacious, being protected by the natural breakwater afforded by the island of San Lorenzo. It is fortified and possesses splendid docking and ship-repairing facilities, which include a floating dock, 300 feet in length. Railway lines approach the docks. Callao has manufactures of refined sugar, lumber, and iron, but is more important as a commercial centre, its exports comprising minerals, sugar, hides, wool, bone, cotton, cocoa, etc., and the chief imports, manufactured articles, coal, and beer. The commerce has shown a considerable decrease since the decline of the guano trade. In 1911 1106 foreign vessels, aggregating 2,672,021 tons, entered and cleared. The value of foreign commerce in 1908 was \$20,817,795, of which \$13,434,393 was imports and \$7,383,402 exports. Pop., 1908, 31,000.

Callao figures in history from the times of the early Spanish conquest. It was considered a fair prize by the pirates who infested the western coast of America in the sixteenth century and later and by them was attacked several times. By 1671 it had become of sufficient importance to merit the dignity of a city. An earthquake of 1630 was followed by the more disastrous commotion of 1746, which, with the accompanying tidal wave, destroyed the city and occasioned great loss of life. About the middle of the eighteenth century Callao was strongly fortified, San Felipe Castle playing a prominent part in subsequent wars. In 1826 the Spanish were driven from the city, their last foothold in continental America. Callao was bombarded by a Spanish fleet in 1866, and in 1880 by the Chileans, into whose power it fell the next year, after the battle of Miraflores. The Treaty of 1883 restored it to Peru.

CALLAWAY, kál'a-wá, SAMUEL RODGER (1850-1904). An American railway president, born in Toronto, Canada. In 1862 he entered the service of the Grand Trunk Railway, in 1874 became superintendent of the Detroit and Milwaukee Railway, and in 1881 became manager of the Chicago and Grand Trunk. He was vice president of the Union Pacific from 1884 to 1887; president of the Toledo, St. Louis, and Kansas City line in 1887-95; and of the New York, Chicago, and St. Louis in 1895-97. He was subsequently president of the Lake Shore and Michigan Southern, from 1897 to 1898, and of the New York Central and Hudson River

Railway from 1898 to 1901, and in 1901 was chosen president of the American Locomotive Company.

CALLCOTT, kəl'kōt, SIR AUGUSTUS WALL (1779-1844). An English landscape painter, born in London. He studied at the Royal Academy under John Hoppner, and first devoted himself to portrait painting. After 1804 he exhibited principally landscapes, many of them Italian subjects, which gained for him the title of the English Claude. His earlier paintings were good in line and warm in color, but later productions are cold and monotonous. He was elected to the Royal Academy in 1810, knighted in 1837, and appointed conservator of royal pictures in 1844. Characteristic examples of his landscapes are "The Mouth of the Tyne" (1820), and "Entrance to the Pool of London" (1816); a good example of his figure paintings is "Milton Dictating to his Daughters" (Leeds).

CALLCOTT, JOHN WALL (1766-1821). An English composer, born in Kensington. Too nervous to be a surgeon, as he had intended, he devoted his attention to music, and in 1785 won three of the four gold medals annually given by the Catch Club, the admired "O Sovereign of the Willing Soul" being one of the successful pieces. During the next 10 years he obtained 20 of the medals given by the same society. In 1784 he was made bachelor, and afterward (1800) doctor of music at Oxford. He studied composition with Haydn in 1790. In 1797 he issued a prospectus of an exhaustive musical dictionary, but because of his poor health could not undertake the work itself. In 1806 he published his *Musical Grammar*; in the following year his mind gave way under the continuous strain to which it had been subjected. He recovered again, but only for three years, when he relapsed, and continued insane until his death. He was especially celebrated for his glee compositions. His choicest productions were published in 2 vols. by his son-in-law, Mr. Horsley, in 1824.

CALL DUCK. A small beautiful breed of domestic ducks, bred in a gray and in a white variety, mainly for show purposes. The object is to make them as small and beautiful as possible. See DUCK.

CALLEJA DEL REY, kál-yá'rá dēl rā'é, FÉLIX MARÍA, CONDE DE CALDERÓN (1750-1820). A Spanish general, born at Medina del Campo. He was sent to Mexico and after Hidalgo revolted defeated him near Guadalajara in 1811. In 1812 he captured the fortress of Guanajuato and murdered the revolutionists. A little later he captured Hidalgo's successor, Father Morelos, who was shot. For his cruelty in these operations Calleja was called "the Butcher." He was Viceroy of Mexico in 1813-16, and was ennobled, with the title of Count of Calderón for his conduct of the battle of the Puente de Calderón, Jan. 17, 1811. In 1819 he was selected to conduct the expedition against the Independents of Paraguay, but along with the other generals of the expedition he was taken prisoner at Cadiz by his own soldiers, who were in revolt at the instigation of Riego and demanded the reestablishment of the Liberal constitution of 1812. He died soon after his release.

CALLENDER, GUY STEVENS (1865-1915). An American economist, born at Harts Grove, Ohio. He was educated at Oberlin College and at Harvard University. After serving as in-

structor in political economy at Wellesley College in 1895-96, and at Harvard in 1897-1900, he became professor of political economy and sociology at Bowdoin College in 1900, and professor of political economy at Yale in 1903. He is author of *Selections from the Economic History of the United States, 1765-1850* (1909).

CALLENDER, HUGH LONGBOURNE (1863-). An English physicist, born at Hatherop. He was educated at Trinity College, Cambridge, and was professor of physics at McGill University, Montreal, in 1893-98, at University College, London, from 1898 to 1902, and finally at the Imperial College of Science, London. His publications include *Law of Condensation of Steam* (1898) and *The Imperial College of Science, London* (1904).

CALLEY, WALTER (1858-). An American clergyman, born at Dover, Del. After graduating from Crozer Theological Seminary (Upland, Pa.) he was ordained to the Baptist ministry in 1880, and thereafter held pastorates at Bethlehem, Pa. (1880-82); Philadelphia (Lehigh Avenue Church, 1882-91); Cambridge, Mass. (Emmanuel Church, 1891-93); Boston (Tabernacle Church, 1893-1902); and at Upland (1905-09). He became pastor of the First Church, Jamaica Plain, Boston, in 1909. From 1902 to 1905 he was managing editor of *Service*, the official organ of the Baptist Young People's Union of America, at the same time acting as general secretary of this organization. He was also one of the founders of Prospect Union, an institution for educating workmen, in connection with Harvard University, and made a special study of penology and sociology.

CALLIAS (Gk. Καλλίας, *Kallias*). 1. The son of Phænippus, of a noble and wealthy Athenian family, the members of which were hereditary torchbearers at the Eleusinian Mysteries. He was an opponent of Pisistratus, and a successful contestant in the Olympic and the Pythian games. 2. The son of Hipponicus and grandson of the preceding. He was present, dressed in his priestly robes, at the battle of Marathon, in 490 B.C. He was sent, between 450 and 445 B.C., as an Ambassador of Athens to Artaxerxes, and, according to some authorities, negotiated a treaty most unfavorable to the Persians. On his return he was impeached for having taken bribes, and fined 50 talents. 3. The son of Hipponicus and grandson of the preceding, notorious for his extravagances and profligacy. In 392 B.C. he served at Corinth, on the occasion of the defeat of the Spartan *mora* by Iphicrates, and was one of the envoys who negotiated the peace with Sparta, known as the Peace of Callias, in 371 B.C. The scene of Xenophon's *Symposium*, and of Plato's *Protagoras*, is laid at his house. He died in poverty.

CALLICRATES (Gk. Καλλικράτης, *Kallikratēs*). A Greek architect of the fifth century B.C., who, together with Ictinus, built the Parthenon on the Acropolis at Athens.

CALLICRATIDAS (Gk. Καλλικρατίδας, *Kallikratidas*). A Spartan, the successor of Lysander in command of the Lacedæmonian fleet against the Athenians (406 B.C.), a man of vigorous character and Pan-Hellenic feeling. At first, he was greatly hampered by the impediments thrown in his way by his predecessor, but he overcame these, and defeated Conon in the harbor of Mitylene, taking 30 of his ships, and subsequently captured the fleet of Diomedon.

Later he was defeated and perished by drowning in the battle of Arginusæ (q.v.).

CALLIERES BONNEVUE, kă'lyâr' bŭn'vü', LOUIS HECTOR, CHEVALIER DE (1639-1703). A French army officer. He was Governor of Montreal in 1684, and in 1687 was leader of a part of the French and Indian forces which invaded the territory of the Five Nations in New York. He visited France to urge the seizure of New York as necessary to maintain French supremacy in Canada. In 1699 he succeeded Frontenac as Governor-General of Canada.

CALLIMACHUS (Gk. Καλλιμαχος, *Kallimachos*). An Athenian artist who lived near the close of the fifth century B.C. He made a famous gold lamp, which burned night and day in the Erechtheum, on the Athenian Acropolis, and he produced a group of dancing Laconian maidens. He is also said to have originated the Corinthian capital and to have been the first to use the running drill for cutting folds of drapery and other deep lines of modelling. His sculptures were marked by exceeding (some said excessive) delicacy and refinement of execution, and there is reason to believe that he was a follower of Calamis. Consult Furtwängler, *Meisterwerke der griechischen Plastik* (Leipzig, 1893), and Gardner, *A Handbook of Greek Sculpture* (London, 1911).

CALLIMACHUS (Gk. Καλλιμαχος, *Kallimachos*) (c.310-240 B.C.). A celebrated Alexandrine poet and grammarian. He was born in Cyrene, of a distinguished family, which traced its ancestry to Battus, the founder of that city. (See BATTIADÆ.) With Aratus of Soli he studied at Athens and then began teaching at Alexandria, where he enjoyed the favor of Ptolemy Philadelphus and his successor, Ptolemy Euergetes. About 260 B.C. he was appointed librarian and held the office for some 20 years. By his teaching and writing Callimachus exerted a great influence on his time. Among his pupils were some of the most celebrated scholars of the day—Eratosthenes, Aristophanes of Byzantium, Apollonius of Rhodes, and others.

According to Suidas, he left behind him over 800 books. Of his learned works in prose, the most important were his *Tablets* (Πίνακες, *Pinakes*), in 120 books, a great catalogue of the works contained in the library; the authors were arranged according to subject matter and date, with brief observations on the size and the genuineness of the works ascribed to them. Through this Callimachus became the founder of the critical study of Greek literature. We know, also, of a collection of glosses, of *Memorabilia* (Τρομνήματα, *Hypomnemata*), and other minor works. As a poet he won distinction chiefly through his elegies, so that Quintilian (10, 1, 58) calls him *elegiac princeps*; in this field he greatly influenced the Romans, especially Catullus and Ovid, and, in even higher degree, Propertius. He wrote also excellent epigrams, preferring the short, highly elaborated poem to such lengthy works as the *Argonautica* of Apollonius Rhodius. His strength lay in his art and learning, not in poetic genius. As an illustration of his learning may be named his four books of *Causes* (Αἰτιαί), in elegiac measure, which treated of the founding of cities, the origin of religious ceremonies, etc. One of the most famous of his elegies was *Berenice's Lock* (*Coma Berenices*), written 246 B.C., in honor of Queen Berenice, and preserved to us in Catullus' imitation, No. 66. Ovid also imitated his *Ibis*, in which he had attacked his rival, Apollonius Rhodius. Famous, also, in antiquity, was his idyllic poem *Hecale*, reminiscences of which are preserved in Ovid's story of Philemon and Baucis (*Met.* 8, 610 et seq.). Some 50 verses of this were recovered from a wooden tablet found in Egypt in 1893. There are extant in a complete state only six hymns, one of which is in elegiac form, and 64 epigrams. These are best edited by Meineke (Berlin, 1861), Schneider (1870-73), and Wilamowitz (Berlin, 1897). For the newly discovered verses of the *Hecale*, consult: Gomperz, *Neue Bruchstücke aus der Hekale des Kallimachos* (Vienna, 1893); *Sammlung der Papyrius Erzherzog Rainer*, vol. vi; Kenyon, "Recent Greek Literary Discoveries," in *The Classical Review*, vol. vii, pp. 429-430 (1893). Consult also: A. Hamette, *Les epigrammes de Callimaque: étude critique et littéraire* (Paris, 1907); Sandys, *A History of Classical Scholarship*, vol. i, pp. 122-124 (Cambridge, 1906); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii (5th ed., Munich, 1911).

CALLING THE DIET. The term used in the Scotch criminal law as equivalent to arraignment (q.v.), although the forms are different from those followed in an arraignment. In Scotland, excepting in cases of high treason, there is no indictment by grand jury, but all prosecutions for criminal offenses before the High Court of Justiciary, and before the sheriff's court, where the sheriff is sitting with a jury, now proceed on indictment in the name of the Lord Advocate. Before a prisoner can be tried the charge preferred against him must have been served 15 days before the trial, with a list of witnesses to be examined against him, and also of the jury panel. When the accused is arraigned for trial the clerk reads the indictment aloud in open court, the same being a formal and orderly statement of the facts which the prosecutor is prepared to prove. The prisoner is then called upon to state his objections to the relevancy of the facts alleged, and is entitled to have the question of the sufficiency of the indictment disposed of by the court before being called on to plead to the facts. This is equivalent to the demurrer (q.v.) of the English and American criminal law. If the objection is sustained, the prosecution for the time fails, and the prisoner is sent back to jail to await another indictment, unless the prosecutor chooses to abandon the case against him altogether. See DIET; INDICTMENT; VERDICT.

CALLINUS (Gk. Καλλίνος, *Kallinos*). A Greek poet, born at Ephesus, an elder contemporary of Archilochus, who flourished in the first half of the seventh century B.C. He first gave Greek elegy a political turn. The remains of his verse urge his fellow citizens to resist the attacks of the Cimmerians, who had invaded Ionia from the north, and to fight bravely in the struggle with Magnesia (q.v.), a neighboring city of Caria. Consult Bergk, *Poetæ Lyrici Græci*, vol. ii (Leipzig, 1878), and Wright, *A Short History of Greek Literature* (New York, 1907).

CALLIOPE, kăl-lî'ô-pē (Gk. Καλλιόπη, *Kalliope*), the lovely-voiced, the sweet-voiced). One of the Muses. When special functions were assigned to individual Muses, Calliope presided over poetry, especially epic poetry. In the later art she is represented with tablets or a roll. In

some mythographers Calliope is the mother of Orpheus or of Linus.

CALLIOPE HUMMER. A humming bird (*Stellula calliope*) of the United States west of the Rocky Mountains. The male is metallic green above and whitish below, with reddish flanks, and the short tail dusky; his gorget is white, the feathers tipped with metallic purplish. It is numerous and makes its nest upon pine branches near cones, which it is made to resemble. For many interesting facts and pictures illustrative of this bird and its nidification, consult Ridgway, *The Hummingbirds* (Smithsonian Institution, Washington, 1892), and Dawson, *Birds of Washington* (Seattle, 1909). See Plate of HUMMING BIRDS.

CALLIPPUS, or **CALIPPUS**, OF CYZICIUS (Gk. *Κάλλιππος*, *Kallippos*). An astronomer of the fourth century B.C. He discovered the error in the Metonic Cycle (q.v.) of 19 years, and substituted a cycle of 76 years, which he supposed to equal 940 lunar months and 27,750 days.

CALIPY'GUS VENUS. A famous statue in the National Museum in Naples, once regarded as that of Venus, and called Callipygus (cf. Gk. *κάλλος*, beauty, *πυγή*, rump), from the part of her body at which she is gazing. It was found in the imperial palaces at Rome, and is said to be the portrait of a hetæra. See HETÆRÆ.

CALLIRRHÖE, *kāl-līr'ró-ē* (Gk. *Καλλιρρόη*, *Kallirrhōē*). 1. A fountain in the bed of the Ilissus, near Athens. In early times the name seems to have been given also to a fountain near the market place, west of the Acropolis, where the tyrant Pisistratus erected his Enneacrounos, or fountain with nine streams. (See ATHENS.) From the fountain in the Ilissus was brought the water for the marriage bath. 2. The town of Edessa (q.v.) also was called Callirrhōe. 3. The wife of Alcmeon, who, yielding to her importunities, obtained from Phegeus the necklace of Harmonia and lost his life in the enterprise. See ALCMÆON.

CALLISTE'IA. See GREEK FESTIVALS.

CALLISTHENES (Gk. *Καλλισθένης*, *Kallisthenēs*) (c.360–328 B.C.). A Greek historian, born at Olynthus. He was a relative of Aristotle, by whom he was educated, in company with Alexander the Great. He lived chiefly at Athens and devoted himself to the study of history. Having accompanied Alexander to the East, he incurred the latter's displeasure, especially by opposing the worship of Alexander as a god (see APOTHEOSIS), and was put to death (328 B.C.) on a charge of treason. Callisthenes wrote several historical works, only fragments of which have come down to us. The extant work on Alexander once ascribed to him is a composition of a much later date (third century A.D.); its author is now referred to as the pseudo-Callisthenes. Of the latter's work there are four Greek versions belonging to the Middle Ages (consult Krumbacher, *Geschichte der byzantinischen Litteratur*, pp. 848–852, Munich, 1897); also Syrian, Armenian, and Slavonic versions. Translations into Latin were made in the fourth and the tenth centuries. Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii (5th ed., Munich, 1911).

CALLIS'TO (Gk. *Καλλιστώ*, *Kallistō*). An Arcadian maiden, attendant upon Artemis, whose story was told with many variations by the Greek poets. Zeus won her love, but Artemis, discovering her condition while she was bathing,

either transformed her into a bear or shot her. Her unborn child, Arcas, was saved by Hermes, at the command of Zeus, and became the ancestor of the Arcadians. (See ARCADIA.) The Alexandrian poet Callimachus seems to have been the first to tell how Zeus placed Callisto among the stars as the constellation of the Bear. Callisto was originally, it is believed, a name under which Artemis herself was worshipped.

CALLISTRATUS (Gk. *Καλλιστράτος*, *Kallistratos*). A famous Athenian orator, born at Aphidnæ. When Athens, in 377 B.C., undertook to form a new Athenian League, he played an active part in the movement. In 371 B.C. he accompanied the Athenian envoys to Sparta, where he urged the cause of peace. In 362 or 361 B.C. he was condemned to death, probably chiefly in consequence of disasters which had befallen the Athenians at Oropus; this city the Thebans, on the advice of Callistratus, had been allowed to occupy temporarily, but they refused to surrender it. He went into exile at Methone, on the Thermaic Gulf, but later returned to Athens and was put to death, 355 B.C. Callistratus was the most famous orator of his time, and his defense of the part he had played in the Oropus matter is said to have produced a profound impression on Demosthenes, who, as a boy, was present at its delivery, and to have led him to study oratory.

CALL OF THE HOUSE. In Great Britain a parliamentary proceeding pursued as late as 1838, for the purpose of insuring a full attendance of either House on occasions of extraordinary importance. It was the custom to give notice in advance that such a call would be made, and on the appointed day all members, under pain of incurring the displeasure of the House, were expected to answer to their names as the roll was read off by counties and boroughs. In the United States a call of the House is moved by the opponent of a measure which is about to be passed, for the purpose of showing that a quorum is not present.

CALLOSITIES. See CORN.

CALLOT, *kā'lō'*, JACQUES (1592–1635). A French etcher and draughtsman. He was born in Nancy, the son of the king-at-arms to the Duke of Burgundy, and was educated for the Church. His predilection for art was such that as a boy he twice ran away to Italy. After studying with local masters, he was in 1606 allowed to go to Rome, where he worked with Tempesta and Thomassin of Troyes. He afterward studied with Parigi at Florence, and was for years in the service of the court of Tuscany. Returning to Nancy, he attained great celebrity at the ducal court, and was invited by the Infanta Isabella to Brussels to commemorate the surrender of Breda. In 1629 he was summoned by Louis XIII to etch the siege of Rochelle; but his patriotism would not permit him to depict in like manner the siege of Nancy, when it was captured by Louis XIII. The war scenes enacted in France at this time were also portrayed by him with great vigor and freshness, in a series of etchings called "Misères et malheurs de la guerre." His reputation, however, rests on his genre subjects, generally small in size, which he treated with great originality, life, and humor. In his larger prints the figures are wooden and academic in character. His imagination was inexhaustible, his drawing spirited and sure. He was the first to raise etching to the rank of an in-

dependent art, and the first important creative genius to devote himself entirely to graphic art. The paintings attributed to him are spurious, and many of his supposed prints are really by his pupils and imitators; but he etched about 1450 plates, among the most celebrated of which are the "Pont-Neuf," the so-called "Madonna of the Imbruneta," a fine example of his method of treating great crowds of people and the two series entitled "Capricci" and "Le Gueux." Consult Méaume, *Recherches sur la vie et les ouvrages de J. Callot* (Paris, 1860), and J. H. Green, *A Catalogue and Description of the Works of the Celebrated J. Callot* (London, 1804).

CALL TO THE UN'CONVERT'ED, THE. See BAXTER, RICHARD.

CALLUNA. See HEATH.

CALLUS (Lat. *callum*, *callus*, hardened skin, hard flesh). The substance that forms between the ends of broken bones during the process of repair, to hold the fragments together. It consists of new or embryonic tissue, and a large part of it is absorbed after union is complete. When the ends of the broken bones are closely approximated, there is only a small bridge of callus formed between them. When the ends of the broken bones move very freely upon one another and separate widely, a large cuff or flange of callus forms, encircling and immobilizing them as a splint would. Such an ensheathing mass of callus is sometimes known as a *temporary* or *provisional callus*, to distinguish it from that portion which lies directly between the apposed fragments of bone and which in time becomes replaced by true bony tissue. When the amount of callus thrown out is excessive, permanent injury may result to adjacent structures if subsequent absorption is only partial. Nerves and tendons may be included in the callus, or a joint may be invaded and rendered useless. Surgical operation is sometimes necessary to remove this excess of callus and restore the parts to their normal condition. See ANATOMY OF PLANTS.

CALLUS, IN PLANTS. When a plant is wounded, the exposed living cells are called into active division again, and the resulting tissue covering the wound is called the callus. One of the most prominent elements of callus is cork, and the cork which originates in the callus is known as wound cork.

CALMAN, WILLIAM THOMAS (1871-). A British zoölogist, born at Dundee, Scotland. He was educated at University College, Dundee (affiliated with St. Andrews), where he became assistant lecturer and demonstrator in zoölogy in 1895. In 1904 he was appointed assistant in the zoölogical department of the British Museum, and in 1905-08 he was examiner in zoölogy at the University of St. Andrews. His publications include: *The Cumacea of the Soboga Expedition* (1905); "Crustacea" in the *Treatise on Zoölogy*, ed. by Sir Ray Lankester (1909); *The Life of Crustacea* (1911).

CALMAR, käl'mär. See KALMAR.

CALMET, käl'mä', AUGUSTIN (1672-1757). A French Benedictine, and exegetical and historical writer. He was born at Mesnil-la-Horgne, near Commercy, Feb. 26, 1672, and in 1689 entered the Order of Benedictines. In 1698 he was appointed teacher of philosophy and theology in the abbey Moyaen-Moutier; in 1704, subprior of a convent of learned monks at Münster, in Alsace; and in 1706 he went to Paris, to

superintend the publication of his *Commentary on the Bible*. He was afterward appointed prior at Lay (1715), abbot of St. Leopold in Nancy (1718), abbot of Senones in Lorraine (1728), and died in Paris, Oct. 25, 1757. His exegetical writings have been commended and studied with advantage by both Roman Catholics and Protestants. The *Commentary on the Bible* (23 vols., Paris, 1707-16), though marred by the author's deficient knowledge of the Oriental languages, and by frequent neglect of real difficulties, contains valuable researches in biblical antiquities, and is valuable for a close adherence to the literal meaning of Scripture, rather than the pursuit of allegorical interpretations. Calmet's *Historical and Critical Dictionary of the Bible* (4 vols., Paris, 1722-28) was translated into English, German, and other languages, and has passed through many editions. His other works—a *History of the Bible*, and of the *Jews* (1718), and a *Universal History* (1735-71)—are mere compilations; but his *History of Lorraine* (4 vols., Nancy, 1728; 2d ed., 6 vols., 1745-47) is founded on original researches. For his life, consult: Fangé (Senones, 1762); A. Digot (Nancy, 1861); and on his correspondence, P. E. Guillaume (Nancy, 1875).

CALMETTE, GASTON (1858-1914). A French journalist, born at Montpellier, France, and educated at the lycées of Brest, Bordeaux, Clermont-Ferrand, and Mâcon. He early became connected with the *Figaro*, was secretary of the editorial board from 1894 to 1903, and from then until his death was editor in chief. He was made a chevalier of the Legion of Honor and was decorated by the Spanish government with the grand cross of the Order of Charles III. His collection of First Empire engravings and caricatures was considered notable. An aggressive and fearless writer, never hesitating to employ scandal to help gain his end, Calmette incurred the bitter enmity of many public men. Early in 1914 he began a sensational attack upon Joseph Caillaux, Minister of Finance and a former Premier (see CAILLAUX; FRANCE, History). This campaign, and especially the threat to publish letters written by Caillaux to Mme. Caillaux when she was the wife of another man, resulted in the murder of Calmette by Mme. Caillaux on March 16, 1914. She testified that she had feared her husband would himself kill the editor.

CALM LATITUDES. The portion of the ocean which lies between the northern and southern trades, and where calms of long duration are likely to prevail. They vary with the season of the year and the consequent shifting of the trade-wind belts. The term is also applied to the region along the polar edge of the trade-wind belts, which is called the Horse Latitudes. See DOLBEURS.

CALMON, käl'môn', MARC ANTOINE (1815-90). A French statesman. He studied law, and held office from 1836 until the Empire, when he refused the oath. In 1871 he became Under-secretary of State in the Department of the Interior, and in December, 1872, prefect of the Department of the Seine. In 1873 he was elected to the National Assembly and became leader of the Left Centre; and in 1875 was chosen life Senator. His works on finance include the following: *Les impôts avant 1789* (1865); *William Pitt* (1865); *Histoire parlementaire des finances de la Restauration* (1868-70); *Etude des finances de l'Angleterre depuis la réforme de Robert Peel, jusqu'en 1869* (1870), and *Histoire*

parlementaire des finances de la monarchie de Juillet (4 vols., 1899). He edited Thiers's *Discours parlementaires* (15 vols., Paris, 1879-83).

CAL/OCHOR/TUS (καλός, *kalos*, beautiful + χόρτος, *chortos*, grass). A genus of liliaceous plants nearly related to the tulips. The species, of which there are 30 or more, are natives of western North America, from Colorado and Montana to British Columbia and California and southward, where they are variously known as Mariposa lily, star tulip, globe tulip, and butterfly tulip. The plants have bulblike corms from which arise the more or less leafy, branched stems, bearing showy flowers of white, red, yellow, and lilac, often darker toward the centre, forming a distinct eye. The three outer parts of the perianth are small and sepal-like, while the inner three are larger, showy, and covered towards their bases with hairs.

Many of the species are in cultivation. *Calochortus venustus*, the butterfly tulip (for illustration, see Plate of CALIFORNIA FLORA), is one of the handsomest and most variable species. *Calochortus nuttallii*, the sego lily, is a beautiful desert species, the corms of which were formerly considered a delicacy by the Indians.

CALOMARDE, ká'ló-már'dá, FRANCISCO TADEO (1775-1842). A Spanish statesman. He was born at Vilel, in Aragon, studied in Saragossa, and became an advocate. During the wars of Napoleon he remained loyal to the national cause, and after the expulsion of the French and the return of Ferdinand VII in 1814, Calomarde was among the first to hurry to Aragon and do homage to him as absolute monarch. As a reward of his obsequious celerity he obtained a post in the Secretariat of the Council for the Indies, and in 1815, when the Council for the Indies was abolished, he was transferred to a similar post in the Ministry of Justice. In the same year, upon the foundation of the American Order of Isabella the Catholic, he was made perpetual secretary thereof. This post he held through all his varying fortunes. Shortly thereafter he fell into disfavor and was confined in Pamplona as a suspect. On the restoration of the constitution in 1820 he unsuccessfully courted the favor of the Liberals; but when the French army in 1823 restored the authority of Ferdinand VII Calomarde was appointed secretary of the *cámara del real patronato*, one of the most influential offices in the kingdom. Not long after the King made him Minister of Justice. While he held this office he showed himself an uncompromising enemy of free thought and progress, and a friend of the old ecclesiastical supremacy, being the acknowledged leader of the Ultraroyal party. He secured the punishment of the Constitutionals. He supported the Portuguese usurper Miguel against the Queen of Portugal and was rewarded with the title of Marqués de Almeida. He was decorated by Ferdinand VII with the Order of Charles III, and founded on Ferdinand's behalf the Pragmatic Sanction of Charles IV, whereby women were admitted to the succession. On the birth of Isabella II he was decorated with the Order of the Golden Fleece, and the King of Naples made him Duke of Santa Isabel. He also secretly favored the party of Don Carlos, but by treating any unseasonable outbreak with great cruelty he preserved himself from the suspicion of being implicated in Carlist schemes. In 1832, when Ferdinand was supposed to be on his deathbed,

he was prevailed on by Calomarde to reintroduce the Salic law, by which the Infanta Isabella was excluded from the throne, and Don Carlos, the favorite of the Absolutists, was appointed successor. The unexpected recovery of the King frustrated Calomarde's schemes, and he fled in disgrace to France. The 10 years of his ministry were known as the Ominous Decade of Calomarde. During the first Carlist war he returned to Tolosa, Spain, and offered his services to Don Carlos; but seeing that he was despised by Carlists and Liberals alike, he returned to Toulouse, where he died. Consult Cárdenas, *Vida de Calomarde*, which appeared as vol. iv of the *Galería de Españoles célebres contemporáneos*, 9 vols., by Pastor Díaz and F. de Cárdenas. (Madrid, 1841-49).

CAL/OMEL (Gk. καλός, *kalos*, beautiful + μέλας, *melas*, black; so called because white, though prepared from a black substance). One of the compounds of mercury and chlorine, known also as the subchloride or mild chloride of mercury, with the symbol Hg₂Cl₂. It is a heavy, white, tasteless, and odorless powder, insoluble in water, ether, or alcohol. It is used in medicine as a cholagogue cathartic. It stimulates the flow of bile. It acts principally upon the upper portion of the intestine and is therefore more effective when followed by a saline purge. It is a valuable adjunct to quinine in malarial fever. Calomel is an antiseptic and is dusted on foul wounds or ulcers, to stimulate and purify them. In the eye it promotes the absorption of corneal opacities. Calomel dissolved in lime water ("black wash") is a valuable lotion in syphilitic sores. The medicinal dose of calomel is from one-half a grain to 10 grains. Excessive doses, or the retention in the system of one large dose, cause swelling of the tongue and gums, and salivation. See MERCURY.

CALONNE, ká'lún', CHARLES ALEXANDRE DE (1734-1802). French Minister of Finance under Louis XVI. He was born Jan. 20, 1734, in Douai. As Advocate General, Procurator General, and Intendant, he had displayed many brilliant but unsubstantial qualities, when, in 1783, at the instance of his patron, Comte d'Artois, and of Vergennes, he was summoned by the King to become Comptroller-General of the Finances. The treasury then was in hopeless disorder, and the whole financial system of the kingdom was inadequate to meet the demands of the extravagant court and administration. Calonne's policy was, by extravagant display, to restore confidence and secure new loans. So for about three years the court revelled with the full approval of the Minister of Finance. But Calonne soon found that public credit requires some more substantial foundation than mere display. Both credit and taxation had reached their absolute limits. A crisis had arrived, with which neither Minister nor King could deal. An Assembly of Notables was therefore called and Calonne opened its session in February, 1787. He laid before them the enormous deficit in the treasury and proposed, as a means of meeting it, that all land in France, that of nobles and clergy included, should be taxed. This was a blow at the incomes of the very men to whom he was proposing it, so it failed of support. Calonne's accounts were examined, and to the great joy of all France he was removed. He left France, settled in England, and married a wealthy English widow. During the Revolution he supported the émigré party. Not until 1802 was he

allowed by Napoleon to return to France. He died in Paris about a month after his return. Consult the authorities referred to under FRANCE for this period; also Susane, *La tactique financière de Calonne*, with bibliography (Paris, 1902).

CALOPHYLLUM (Neo-Lat., from Gk. *καλός*, *kalos*, beautiful + *φύλλον*, *phyllon*, leaf). A genus of trees of the family Guttiferæ, natives of warm climates. Some of the species yield valuable timber, as the piney tree (*Calophyllum angustifolium*), which grows at Penang and in the islands to the eastward of the Bay of Bengal, attaining large proportions in ravines and narrow, moist valleys, and furnishes the beautiful straight spars called "Poon." The resinous products of some species are valuable, and among them are some of the substances known by the name of Tacamahaca. *Calophyllum inophyllum* is a very large and beautiful umbrageous tree, often planted for its shade and the fragrance of its flowers, which are white and in loose axillary racemes. It is one of the most valuable timber trees of the South Sea Islands. The timber resembles mahogany, being of equally close texture, although of lighter color, and very durable. The leaves are oblong and obtuse; the fruit is a globose drupe or stone fruit, about the size of a walnut, and a fixed oil is expressed from its kernel, which is used for lamps, etc. In the Hawaiian Islands this oil is extensively applied to bruises and in rheumatism. A similar oil is expressed from the seed of *Calophyllum calaba*, a native of Ceylon, which also has white sweet-scented flowers, and whose timber is used for various purposes, particularly for staves, cask-headings, and housebuilding. Considerable difference of opinion exists as to the species producing the Tacamahaca resin and the Poon spars. The more recent authors state that *Calophyllum calaba* yields the true Tacamahaca and *Calophyllum inophyllum* a resin quite similar. Doubtless several species furnish the Poon spars. There are a number of other species, some of which yield heavy, durable timber that is valuable for engineering purposes.

CALORIC (Fr. *calorique*, from Lat. *calor*, heat). An early term for heat, when it was considered an invisible, imponderable fluid. See HEAT.

CALORIC ENGINE. A trade or commercial name given by John Ericsson (q.v.) to a form of hot-air engine. See HOT-AIR ENGINE.

CALORIE. See FUEL.

CALORIMETRY (from Lat. *calor*, heat + Gk. *μέτρον*, *metron*, measure). The science of the measurement of quantities of energy, when manifested by heat effects. By the name "heat effects" is meant the changes produced in material bodies when they are exposed to what is called a "source of heat," e.g., a flame or the rays of the sun. Among these changes which may take place are expansion, fusion, evaporation, alteration in electrical and magnetic properties, etc. It is now believed that these changes are occasioned by increase in the energy of the smallest portions of the bodies. When a body is "heated" or "warmed," we mean that its minute parts gain energy; and opposite changes, e.g., freezing, condensation, cooling, etc., take place when these parts lose energy. It is the province of calorimetry to measure these amounts of energy gained or lost.

The *erg* (see MECHANICAL UNITS) is the unit of energy and work, and therefore all quantities

of energy should be measured in terms of it; but it rarely happens that heat effects are due directly to mechanical work except in case of friction. Consequently the *erg* is not a convenient unit. Heat effects and the energy required to produce them are almost invariably compared with one definite heat effect, viz., rise in temperature of water; and the practical unit employed for measuring thermal energy may be defined as the quantity of energy required to raise the temperature of one gram of water from 15° to 16° C. on the thermometric scale of the constant-pressure hydrogen thermometer. (Other definitions of a practical unit have been proposed, e.g., by the substitution of 20° to 21° in place of 15° to 16° C.; or the one-hundredth portion of the quantity of energy required to raise the temperature of one gram of water from the freezing point to the boiling point under normal pressure.) This practical unit is called the *calorie*, and its value is very nearly 4.187 joules, or 4.187×10^7 ergs. See HEAT.

By the "specific heat" of a substance at a given temperature and under definite conditions is meant the number of calories required to raise the temperature of one gram of the substance one degree by the hydrogen scale (see THERMOMETER), at that temperature and under those conditions. In general, however, we make use of the *average specific heat*, i.e., the number of calories required to raise the temperature of one gram through t degrees, divided by t . By the "latent heat" of a substance for a definite change of state (e.g., fusion, evaporation, sublimation, dissociation), under definite conditions, is meant the number of calories required to produce the particular change of state in one gram of the substance under the specified conditions. Thus we speak of the "specific heat of air at constant pressure," or the "latent heat of evaporation of water at normal atmospheric pressure." Calorimetry is, then, chiefly, the science of measuring specific and latent heats.

There are two general methods for the measurement of specific heats, which may be regarded as satisfactory—the method of mixtures and the use of an ice or a steam calorimeter. In the method of mixtures a known quantity of the substance at a known temperature is mixed with a known quantity of some liquid at a different known temperature and the temperature of the mixture is observed. The specific heat of the liquid for the given range of temperature being known, and allowance being made for losses by radiation and conduction, and for the calories spent in changing the temperature of the vessel containing the liquid, the specific heat of the substance may be at once deduced. The most improved form of apparatus for use in this method is that of Prof. F. A. Waterman, a full description of which is given in the *Physical Review*, vol. iv, p. 161 (1896).

In the ice calorimeter, the substance whose specific heat is desired is introduced into an apparatus which allows the heat energy withdrawn from the body to be spent entirely in melting ice. The change in temperature of the substance and the quantity of ice melted may be observed; and thus, assuming that the latent heat of ice is known, the specific heat of the substance may be calculated. This method is due to Black; and the most improved apparatus is that designed by the late Professor Bunsen of Heidelberg. The most accurate method of using

the "Bunsen calorimeter" is that of Dr. Dieterici, of Hanover. (Consult *Wiedemann's Annalen der Physik und der Chemie*, vol. xxxvii, p. 494, 1889.) Fairly satisfactory descriptions are given in almost all general textbooks on physics. In the "steam calorimeter" the substance whose specific heat is desired is suspended on one pan of a chemical balance, which is inclosed in a box connected with a steam boiler; if the steam is suddenly admitted, some of it will continue to condense on the pan and the substance until their temperature is raised to that of the steam. The quantity of steam thus condensed may be weighed by placing weights in the other pan of the balance, and, if the latent heat of condensation of steam is known, the specific heat may easily be calculated. This method is due to Professor Joly, of Dublin, and a full description of the latest improvements may be found in the *Philosophical Transactions of the Royal Society of London* (1894). In all these methods it should be noted that what is measured is the *average specific heat* of the substance over a given range of temperature. For other methods of measurement of specific heat, reference may be made to the larger treatises on physics.

To measure the latent heat of fusion two methods have been used successfully: one is an obvious application of the method of mixtures; the other is to secure the fusion by means of the heating action of an electric current, whose intensity and electromotive force may be measured, thus giving the quantity of energy consumed in producing the fusion.

To measure the latent heat of evaporation, two similar methods have been used, and a third also. If the vapor is conducted through a long spiral tube surrounded by water, the vapor will condense, the temperature of the water will be raised, and thus we have simply the method of mixtures. Or a liquid may be made to evaporate by means of a reduced pressure, and the consequent fall of temperature may be balanced by the heating action of a known electric current. Again, if a liquid inclosed in a Bunsen calorimeter is caused to evaporate, the surrounding water will be frozen—just the reverse of the general use of the apparatus—and the quantity frozen may be measured. For full description of these various methods for measuring latent heats of all kinds, reference should be made to general treatises on heat. Preston's *Theory of Heat* (London, 1894) is perhaps the best book of reference.

Another class of calorimeters is designed to enable the observer to ascertain the number of calories furnished when certain fuels, such as coals, oils, etc., are allowed to burn under definite conditions. In these the coal is placed in a hollow steel cylinder which can be tightly closed, oxygen is admitted under high pressure, and combustion is started by means of an electric current through a fuse wire. The cylinder is kept immersed in water, the rise of temperature of which is observed, and the energy generated thus measured. Calorimeters constructed on a large scale are used to measure the amount of heat given off by an animal or human being, the amount of food and air supplied to the subject of the test being recorded. Prof. W. O. Atwater, of Wesleyan University, carried on a number of experiments with such an instrument and ascertained the fuel value of various foods. His results are to be found in a series of bulle-

tins issued by the United States Department of Agriculture. Subsequent work in this field has been conducted with considerable success by the Nutrition Laboratory of the Carnegie Institution of Washington at Boston, Mass., under the direction of Dr. Benedict, where with improved apparatus and equipment much progress has been made. For an illustration of the Mahler calorimeter, see FUEL.

CALOTTISTES, *kà'lò'tèst'* (Fr. *Calottiste*, from *calotte*, dimin. of OF. *cale*, cap). A society of wits and satirists in the time of Louis XIV and Louis XV, known as the Régiment de la Calotte. They were headed by two officers in the King's bodyguard, named Torsac and Aymond. Their amusement consisted in sending to any public character who had exposed himself to ridicule a "patent" authorizing him to wear the *calotte* as a covering for the weak part of his head. The armorial bearings of the Régiment de la Calotte consisted of various symbols of folly, with the mottoes *C'est regner que de savoir rire*, and *Favet Momus, Luna Influit*. When Torsac, its first "generalissimo," died, the society, which occupied a position of satirical hostility to the French Academy, drew up a burlesque funeral oration, manufactured out of the pompously eulogistic phrases which the academicians were in the habit of using. As the society became more audacious and did not spare even royalty itself, it was dissolved by the Minister, Fleury. The *Mémoires pour servir à l'histoire de la Calotte* (Basel, 1725) is an amusing little book. During the Bourbon Restoration the title *Régime de la Calotte* was applied to the priestly administration of affairs. Consult *Journal historique et anecdotique du règne de Louis XV de l'avocat Barbier* (ed. 1857).

CALOTYPE (Gk. *καλός*, *kalos*, beautiful + *τύπος*, *typos*, impression). A name applied to one of the earliest processes for producing photographic prints as well as to the prints themselves. The process was invented by William Henry Fox Talbot (q.v.) in 1840. It consists of the following operations. A sheet of good plain paper, with a smooth surface and a close and even texture, is washed by means of a soft brush with a solution of 100 grains of crystallized silver nitrate in 6 ounces of distilled water. The paper is allowed to dry in a dark room and is then dipped into a solution of potassium iodide made by dissolving 500 grains of that salt in a pint of water. After a few minutes it is removed and then dipped into water and dried. This "iodized paper" is exceedingly sensitive to light, and may be kept for some time if it is carefully protected from sunlight. When required for use, a sheet of it is washed in a mixture which Mr. Talbot called gallonitrate of silver. The mixture is obtained by adding a saturated solution of gallic acid to an equal volume of a solution of 100 grains of crystallized silver nitrate in 2 ounces of distilled water, to which one-sixth of its volume of strong acetic acid had been added. After the iodized paper has been washed over with this solution it is dipped into water and then cautiously dried with blotting paper. An exposure of less than a second in diffused daylight is sufficient to obtain an impression. In order to develop the impression the paper is again washed with gallo-nitrate of silver and dried near a fire, the exposed portions becoming brown, while the covered portions retain their original color. The picture is then fixed by consecutively

washing it in clean water, drying, washing in a solution of potassium bromide (100 grains in 8 ounces of water), washing in water to remove any surplus iodide solution, and finally drying. The calotype process has been superseded by other processes and is at present hardly ever used. See PHOTOGRAPHY.

CALOVIUS (KALAN), ABRAHAM (1612-86). A German Lutheran theologian, born in Mohrun-gen, East Prussia. He became rector of the gymnasium in Danzig (1643) and professor of theology in Wittenberg (1650). He was a strong polemical writer against Romanists, Socinians, and Calvinists, and in particular Georg Calixtus (q.v.). His chief works were *Systema Locorum Theologicorum* (12 vols., 1665-77) and *Biblia Illustrata* (4 vols.), defending the orthodox views of inspiration against Grotius.

CALPE, käl'pé. See HERCULES, PILLARS OF. **CALPEE**, or **KALPI**, käl'pé. A city in the Jalaun district of the United Provinces, British India, on the right bank of the Jumna, in lat. 26° 7' N. and long. 79° 48' E. (Map: India, C 3). Pop., 1901, 10,139; 1911, 10,568. It is an entrepôt for the rice, cotton, and grain of the neighboring district, and has manufactures of cotton, paper, and sugar. After a long period of decay, it is beginning to revive. It is 51 miles southwest of Cawnpore and is closely linked with it in the history of the great mutiny of 1857-58.

CALPURNIA. See CALPURNIUS.

CALPURNIA GENS. See CALPURNIUS.

CALPURNIUS. The Calpurnia gens was, by its own account, one of the oldest plebeian clans in Rome; but it does not figure in history till the time of the First Punic War. The family names, in the time of the Republic, were Bestia, Bibulus, Flamma, and Piso.—**MARCUS CALPURNIUS BIBULUS** is known as the hostile and incapable colleague of Cæsar (59 B.C.) in the consulate (consult Suetonius, *Julius*, 20). He was put up by the aristocratic party, who spent vast sums to carry the election. He finally joined the Pompeian party, had command of the fleet intended to prevent Cæsar's passage to Greece, and died 48 B.C., before the battle of Dyrrhachium. Among the Roman women of this family, two are celebrated—**CALPURNIA**, the daughter of Lucius Calpurnius Piso (consul 58 B.C.), and the last wife of Cæsar (from 59 B.C.), who seems, from the scanty notices of her we possess, to have been a quiet domestic woman, full of love and solicitude for her great husband, whom she survived; and **CALPURNIA**, the daughter of L. Calpurnius Bestia, wife of P. Antistius, who killed herself when her husband was murdered by order of the younger Marius, 82 B.C.

CALPURNIUS, TITUS, surnamed **SICULUS**. A little-known pastoral poet of the reign of Nero (54-68 A.D.). He was the author of seven eclogues in close imitation of Vergil, not without poetical feeling, but exaggerated and artificial. These have been edited by Schenkl (Leipzig, 1885) and Keene (London, 1887), and translated by Scott (London, 1890). Consult Butler, *Post Augustan Poetry*, pp. 150-159 (Oxford, 1909).

CALTAGIBONE, käl'tá-jé-rō'ná (from Ar. *Kalat-al-Girche*, fortress of Girche, a Saracen general, who captured the place in the eighth century). A city in the Province of Catania, Sicily, 57 miles southwest of Catania (Map: Italy, J 10). It is situated on two steep hills, 2000 feet above sea level, and is considered the

best-built city in Sicily. The streets are wide and well paved, and a stone stairway, dating from 1506, ascends from the large market place to the castle. The manufacture of terra-cotta figures, particularly of Sicilians and Calabrians in national costumes, is the chief industry. Mosaics and vases, disclosed by excavating, point to an ancient town of unknown origin. Pop., (commune), 1881, 32,000; 1901, 44,879; 1910, 43,169.

CALTANISSETTA, käl'tá-né-sét'tá (Ar. *Kalat-al-Nisa*, fortress of Nisa; Nisa was a Sicanian town). An episcopal city in central Sicily, capital of the Province of Caltanissetta, situated on a hill 1930 feet above sea level, near the Salso, about 80 miles west of Catania, and southeast of Palermo (Map: Italy, J 10). The town has a castle, a cathedral with paintings of the later Sicilian school, public gardens, a seminary and a gymnasium, a school of technology and a school of mines, and a theatre. Two miles to the east is a beautiful Norman monastery erected in 1153 by Roger II, and 2 miles farther is a mud volcano resembling the Maccaluba (q.v., under ARAGONA), and an oil well. Caltanissetta is the centre of the sulphur industry of Sicily. Pop., 1881 (commune), 30,000; 1901, 43,300; 1910, 40,927.

CAL'THA. See MARSH MARIGOLD.

CALTON (käl'ton) **HILL**. An elevation in the northeastern part of Edinburgh, overlooking the Forth. Three monuments surmount it—one in memory of Dugald Stewart, another in memory of Nelson, and a third in celebration of the battle of Waterloo.

CALUM'BA, or **COLOM'BA** (Neo-Lat., probably from Mozambique *Kalumb*; according to some, the name is derived from Colombo, in Ceylon). The root of *Jateorrhiza palmata*, a herbaceous plant of the natural order Menispermaceæ, a native of eastern Africa and cultivated in some East Indian islands. The flowers have 12 sepals and petals, similar in appearance, and disposed in four rows. The male and female flowers are on separate plants. The leaves are nearly circular, with five to seven lobes, on long hairy footstalks, and solitary axillary racemes of small green flowers, the racemes of the male plants branching. The fruit is a drupe, or one-seeded berry-like fruit, about the size of a hazel nut, densely clothed with long hairs. The stem is annual and twining; the root perennial, consisting of clustered, spindle-shaped, fleshy tubers, with a brown warty epidermis, internally deep yellow, with a bitter taste and faint aromatic odor. Its bitterness is ascribed to a somewhat narcotic principle called calumbine, and to berberine, an alkaloid originally discovered in the barberry. Calumba is a useful stomachic, or bitter tonic. As it contains no tannin, it may be taken with preparations of iron. It is sometimes given to allay vomiting and has been found useful in diarrhoea and dysentery. It is administered in the form of powder, fluid extract, or tincture. An infusion of calumba injected into the rectum is a sovereign remedy for thread worms. The poisonous seed known by the name of *Cocculus Indicus* (q.v.) belongs to a plant of a different but allied genus. The root of *Fraseria walteri* is sometimes fraudulently substituted for calumba and has been called American calumba root. It differs from calumba in its properties and appearance; it undergoes no such change of color when touched with tincture of iodine,

whereas true calumba root turns blue owing to the presence of starch. See FRASERA.

CALUMET (Fr., Late Lat. *calamellus*, dim. of Lat. *calamus*, reed). The popular name for the Indian ceremonial pipe. The Indians had pipes of various shapes and sizes, made of clay, stone, or bone, but the ceremonial pipe was usually of large size, in the East and Southeast of white stone, and in the West of the red catlinite from the noted pipestone quarry in Minnesota. The stem was made long, of wood



CALUMET.

or reed ornamented with feathers and porcupine quillwork. Native tobacco, mixed with willow bark or sumac leaves, was used. Although frequently referred to as the "peace pipe," the ceremonial pipe was in fact used in the ratification of all solemn engagements, both of war and of peace.

CALUMET. A township in Houghton Co., Mich., 68 miles (direct) northwest of Marquette, on the Copper Range, the Keweenaw Central, and the Mineral Range railroads (Map: Michigan, A 1). It includes the villages of Laurium and Red Jacket. Calumet is in one of the most productive copper regions in the United States, and the mining of this metal is the chief industry. Immediately west of Laurium is the celebrated Calumet and Hecla mine. A ten-million-dollar water-power project on the Sturgeon River, 15 miles to the south, is now under way, and will, when completed, greatly enhance the industrial facilities of the district. Calumet was the scene of a prolonged labor dispute in 1913, beginning on July 23, when a strike was declared by the Western Federation of Miners. Pop., 1900, 25,991; 1910, 32,345.

CALUMET AND HECLA. See COPPER.

CALUMPIT, kál'vóm-pét'. A town of Luzon, Philippines, in the Province of Bulacán. It is situated on the river Pampanga and is connected by rail with Manila, from which it is distant 27 miles. Pop., 1903, 13,897.

CALVADOS, kál'vá'dós' (from Calvados, corruption of *Salvador*, the name of a vessel of the Great Armada, which was wrecked here). A northern maritime department of France, bounded north by the English Channel, and east and west and south by the departments of Eure, Manche, and Orne (Map: France, N., E 3). It is the most historical section of the old Province of Normandy. The principal rivers are the Orne, Tocques, Dives, Solles, Dromme, and Vire. The coast is partly formed by bold ridges, cliffs, and reefs. The soil of the department is generally fertile, supplying wheat, barley, oats, and rich pasturage for cattle, sheep, and horses, which, with swine, constitute the principal wealth of Calvados. Fishing is also a thriving

industry. Calvados is famous for its cider. The climate is healthful, though changeable. Iron, marble, slate, and coal are found. Area, 2198 square miles. Population, 1901, 410,178; 1911, 396,318. Capital, Caen.

CALVAERT, kál'vært, or **CALUWAERT**, DENYS (DIONYSIUS) (1540-1619). A Flemish-Italian historical and landscape painter (called in Italy DIONISIO FIAMMINGO, 'the Fleming'). He was born in Antwerp, and was registered as an art pupil there in 1556; but he soon went to Italy and studied in Bologna under Prospero Fontana, and later under Sabbatini, assisting the latter in his frescoes in the Vatican. About 1574 he opened a school in Bologna and had among his students the celebrated Domenichino, Guido Reni, and Albani. Most of his pictures are still preserved in Bologna, where he died; others are to be found in England, Dresden, and Vienna.

CALVARY. In Roman Catholic countries, a representation of the various scenes of the passion and crucifixion of Jesus Christ, either in a chapel, or external to the church. It consists of three crosses with the figures of Christ and the thieves, usually as large as life, surrounded by a number of figures, representing the various personages who took part in the crucifixion. At Aix-la-Chapelle the calvary is a church on the top of a hill, surrounded by 12 sculptured stones, each marking an event which took place on the journey of Jesus to Mount Calvary. The approach to the calvary is called the *Via Dolorosa*, each of the stones marking a station (see STATIONS), at which the pious say a prayer in passing. See VIA DOLOROSA.

CALVÉ, kál'vá', EMMA, stage name of EMMA DE ROQUER (1864-1921). A French dramatic soprano. She was born in Decazeville, Department of Aveyron, France, of a Spanish father and a French mother, and was brought up in a convent school near her home. She studied under Rosine Laborde, and made her début in *Faust* at the La Monnaie, Brussels (1882). Though praised, she showed no trace of her now admired fiery temperament. She overexerted her voice and, on Gevaert's advice, went to Marchesi, reappearing (in 1884) in Dubois's *Aben Hamet* at the Théâtre des Italiens, then directed by Maurel. Since then she has sung at the Opéra Comique, at the Grand Opera, in England, Italy, Spain, Russia, and the United States. From 1893 to 1904 she was one of the greatest stars of the Metropolitan Opera House, her interpretation of Carmen being regarded as peerless. After 1909 she practically abandoned the stage, devoting her time to extensive concert tours. She created the leading parts in Joncières' *Chevalier Jean* (1885), Samara's *Flora Mirabilis* (1886), De Lara's *Messaline* (1900), Massenet's *Navarraise* (1895), and *Sapho* (1897), the last two written especially for her.

Calvé's voice is a rich soprano sfogato of 2½ octaves from *g* to *c*², perfectly even throughout, with a contralto-like low register. Her extraordinary dramatic powers have gained for her the title of the "Singing Duse."

CALVERLEY, kál'vēr-lī, CHARLES STUART (1831-84). An English humorist, born at Martley, Worcestershire. His father was the Rev. Henry Blayds, a name adopted near the first of the century, but in 1852 again changed to the ancestral Calverley. He was educated at Balliol College, Oxford, and at Christ's College, Cambridge, of which, after a brilliant career, he was

appointed fellow (1858). At this time he was famous among his friends for many parodies and an examination paper on *Pickwick*. His publications are *Verses and Translations* (1862); *Translations into English and Latin* (1866); *Theocritus Translated into English Verse* (1869); *The Idylls of Theocritus and the Eclogues of Vergil Translated into English Verse; with an Introduction by R. Y. Tyrell* (London, 1908); and *Fly Leaves* (1872). Calverley holds a high place among writers of light and humorous verse, and his Latin renderings are exceedingly felicitous. After years of ill health, he died Feb. 17, 1884. His *Complete Works* (London, 1901) contain a good biographical notice by Sir W. J. Sendall. Consult Sendall, *Literary Remains*, with memoir (London, 1885).

CALVERT. A city in Robertson Co., Tex., 123 miles northwest of Houston, on the Houston and Texas Central and the International and Great Northern railroads (Map: Texas, D 4). It is the shipping point for a cotton-growing and stock-raising region, and has a large cotton gin and cottonseed-oil mill. Lignite is mined also. Pop., 1890, 2632; 1900, 3322; 1910, 2579; 1914 (local est.), 5046. In December, 1913, the Brazos River, near here, overflowed its banks, causing a loss of 19 lives and property damages of \$1,000,000.

CALVERT, GEORGE and CECIL. See BALTIMORE, BARONS.

CALVERT, GEORGE HENRY (1803-89). An American journalist and author, born in Baltimore, Md., a descendant of Lord Baltimore. He graduated at Harvard in 1823, studied in Göttingen, and, on his return from Germany, became editor of the *Baltimore American*. In 1843 he removed to Newport, R. I., of which city he was elected mayor in 1853. He published both prose and verse, including dramas, translations, and critical essays. Among them were: *Illustrations of Phrenology* (1832), the first American treatise on the subject, published at the time of Spurzheim's visit; *Scenes and Thoughts in Europe* (1846-52); *The Gentleman* (1863); *Goethe: His Life and Work* (1872); and *Three Score, and Other Poems* (1883). He translated the correspondence of Schiller and Goethe (1845) and Schiller's *Don Carlos* (1836).

CALVERT, SIR HARRY (1763-1826). An English general. He was born at Hampton, and was educated at Harrow. He became second lieutenant of the Royal Welsh Fusiliers (1778), participated in the siege of Charleston and in the last campaign of Cornwallis, and was a prisoner in America until 1783. He took part in the war with France which began in 1793, and became lieutenant general in 1810, baronet in 1818, and general in 1821. As adjutant general (1799-1818) he carried through important army reforms, especially in training schools. Consult *Journals and Correspondence of Sir Harry Calvert, Bart.* (London, 1853), ed. by his son, Sir H. Verney.

CALVERT, LEONARD (c.1582-1647). The first Colonial Governor of Maryland. He was the brother of Cecil Calvert, the second Lord Baltimore, and by him was placed in charge, as Governor, of the small company of 200 men who in 1634 settled in Maryland under the charter secured from Charles I by George Calvert, first Lord Baltimore. He continued to act as Governor until his death. Perhaps the most noteworthy event during his term as Governor was his contest with William Clai-

borne (q.v.), who had settled on Kent Island in 1631, and denied the jurisdiction of the Maryland authorities. Calvert captured the island in 1638, when Claiborne was in England, but the latter in 1645 succeeded in expelling Calvert, who, however, again defeated him in 1646. Consult Mereness, *Maryland as a Proprietary Province* (New York, 1901).

CALVES' HEAD CLUB. An association whose purpose was to ridicule the memory of Charles I. Its history is very obscure. According to the *Secret History of the Calves' Head Club* (2d ed., 1703), probably written by the notorious Ned Ward, it was originated by John Milton, and its meetings were given over to unseemly orgies in contempt of the Stuarts; but this book is absolutely worthless. Apparently there was no fixed place of assembly. The principal gathering is said to have taken place each year on January 30, the anniversary of the King's execution. It is highly improbable that the organization long survived the Restoration. If so, its proceedings must have been entirely secret. In 1735 a meeting of some young men calling themselves the Calves' Head Club was held at a tavern in Suffolk Street, London. An accident gave rise to a riot. As usually explained, the disturbance was caused by scandalous toasts offered within hearing of the crowd; but this is denied by Lord Middlesex, who was present. The affair has recently been pronounced a hoax, having no connection with the original association, which had doubtless long since ceased to exist. Consult Timbs, *Clubs and Club Life in London* (new ed., London, 1898). Compare: Wilson, *Memoirs of the Life and Times of Daniel De Foë* (London, 1830); Spence, *Anecdotes* (2d ed., London, 1858); Walford, *Old and New London* (London, n.d.); *Harleian Miscellany*, vol. xii (London, 1811).

CALVI, kâl'vê. A fortified seaport of Corsica (belonging to France), situated on a peninsula in the Gulf of Calvi, about 38 miles west-southwest of Bastia. It has an old cathedral and, though the harbor is poor, it is the nearest Corsican port to the French coast, and carries on some trade in fish and southern fruit (Map: France, S, M 6). Calvi was founded in the thirteenth century by the Genoese and was captured by the English in 1794, after a siege of 51 days. It was again acquired by France in the following century. Pop., 1901, 1998; 1911, 2269.

CALVILLE, Fr. pron. kâl-vêl' (Fr., from Lat. *calvus*, bald, smooth surface). A kind of apple, of which there are numerous subvarieties. The Calvilles diminish in thickness from the middle towards the calyx, where they form a point; they have regular ribs and a large open seed chamber; also a pleasant smell, and are oily to the touch. They are never altogether streaked; they have a fine loose flesh, with a flavor somewhat resembling that of the raspberry or strawberry. The white winter Calville is in high repute, both as a culinary and dessert apple; it is very extensively cultivated on the continent of Europe. This class of apples was early introduced in America, but is not now listed in the catalogues.

CALVIN (in its French form *Cauvin*, or *Caulvin*), JOHN (1509-64). One of the most eminent of the reformers of the sixteenth century. He was born at Noyon, in Picardy, France, July 10, 1509. His father, Gérard Cauvin, was procureur-fiscal of the District of

Noyon, and secretary of the diocese. His mother was Jeanne Lefranc. He was one of six children—four sons and two daughters. All the three sons who survived were bred ecclesiastics; and the reformer himself, on May 29, 1521, while still only 12 years of age, was appointed to receive part of the revenue of a chapel in the cathedral church of Noyon. This he held as a means of support during the period of his education, and even for some short time after he had entered upon his reforming career. Calvin was educated in circumstances of ease and even of affluence. The noble family of Montmor, in the neighborhood, invited him to share in the studies of their children; he was in some measure adopted by them, and when the family went to Paris, in his fourteenth year (1523), he accompanied them, and participated in the benefits of the higher instruction which was there attainable. He was entered as a pupil in the Collège de la Marche, under the regency of Mathurin Cordier, better remembered, perhaps, by his Latin name of Corderius. It was under this distinguished master that Calvin laid the foundation of his own wonderful mastery of the Latin language. Not long afterward he left him for the strictly ecclesiastical college of Montaigu, in the same university. During this early period he was distinguished by the great activity of his mental powers and the grave severity of his manners. His companions, it is said, surnamed him the "Accusative."

Probably at first his father intended that he should study theology, for in 1527 he got him the curacy of St. Martin de Martheville (near Vermands, Aisne) in addition to that of the chapel, which, however, Calvin resigned in 1529, in favor of his younger brother, and the same year exchanged the curacy for another, that of Pont l'Évêque, where his father had been born. But in 1528 his father changed his mind and determined that he should become a lawyer. He therefore sent him, with the view to his studying law, to the University of Orleans, then adorned by Pierre de l'Étoile, one of the most famous jurists of his day. At Orleans he continued the same life of rigorous temperance and earnest studiousness for which he was already noted. Beza says that, after supping moderately, he would spend half the night in study and devote the morning to meditation on what he had acquired. His undue habits of study seem to have laid thus early the foundation of the ill health which marked his later years. It was while a law student in Orleans that he became acquainted with the Scriptures and received his first impulse to theological studies. A relative of his, Pierre Robert Olivetan, was there engaged in a translation of the Scriptures; and this attracted Calvin's attention, and awakened within him the religious instinct which was soon to prove the master principle of his life. We cannot say as yet that his traditional opinions were unsettled or that he had embraced with any decision Protestant opinions; but the seeds of the new faith were now beyond doubt sown, and from this time, although he still continued for a while longer to pursue his legal studies, his main interests appear to have been religious and theological. From Orleans he went to Bourges (1530), where he acquired a knowledge of Greek, under the tuition of a learned German, Melchior Wolmar, whose spiritual instructions influenced him. He began here to preach the reformed doctrines and

passed into the ranks of Protestantism, under the slow but sure growth of his new convictions rather than under the agitation of any violent feeling. Here, as everywhere, his life presents a marked contrast to that of Luther.

The death of his father in 1531 left him free to follow his inclinations, which were for theological and classical studies. He proceeded to Paris, which at this date had become a centre of the "new learning," under the teaching of Lefevre and Farel, and the influence of the Queen of Navarre, sister of Francis I. There he published, at his own expense, in 1532, his first book, a commentary on Seneca's essay *On Mercy*. But reformed notions in theology were in the air. The Sorbonne itself had not escaped the infection. There was a growing religious excitement in the university, in the court, and even among the bishops. This, however, was not to last. The King was soon stirred up to take active measures to quell this rising spirit. Calvin was himself converted to the new views, and when his friend, Nicholas Cop, had been elected to the rectorship of the University of Paris, he wrote the inaugural oration (1533) for him and took for his theme the necessity of a reformation of the Church and of theology on the basis of the New Testament. The result was that Calvin and Cop were obliged to flee for their lives. The story is that Calvin narrowly escaped, having descended from his window by means of his sheets, and fled, under the guise of a vinedresser, a friend of his, in whose clothes he concealed himself. After this he repaired for a short time to his native place, resigned the preferment he held in the Roman Catholic church, and for nearly three years led a wandering life, sheltered in various places. We find him at Saintonge; at Nérac, the residence of the Queen of Navarre; at Angoulême, with his friend, Louis Tillet; then for a brief period, while in Paris again, strangely enough expecting a meeting with Servetus, who had expressed a desire to see and confer with him. Persecution against the Protestants raged so hotly that Calvin was no longer safe in France; and he betook himself to Basel, where he prepared the first edition of the *Institutes of the Christian Religion* (1536), with the famous preface addressed to Francis I. The concentrated vigor of this address and its intensity of feeling make it one of the most memorable documents in connection with the Reformation. It is throughout a noble defense of the righteous character of the reformed doctrines, and their support alike in Scripture and in history. The energetic decisiveness and moral zeal of the future teacher and legislator of Geneva speak in every page of it. After completing this great service to the cause of Protestantism, he went for a short time to Italy, to visit Renée, the Duchess of Ferrara. Finally, he revisited his native town, sold the paternal estate, which had devolved to him on the death of his eldest brother, and then set out, in company with his younger brother and sister, on his way to Strassburg. The direct road being rendered dangerous by the armies of Charles V, which had penetrated into France, he sought a circuitous route through Savoy and Geneva.

The result of this journey was memorable for the cause of the Reformation. Arrived in Geneva (July, 1536), he met there his friend, Louis du Tillet, who communicated the fact of his arrival to Farel, then in the very midst of

his struggle to promote the Reformation in the city and neighborhood. Farel hastened to see him and urged upon him the duty of remaining and undertaking his share of the work of God, under the burden of which he himself was likely to sink. Calvin did not at first respond to the call. He was given, he himself says, to his "own thoughts and private studies." He wished to devote himself to the service of the reformed churches generally rather than to the care of any particular church. A life of intellectual and theological labor was at that time most congenial to him. By some strange insight, however, Farel discerned the higher fitness of the young stranger, and he ventured, in the spirit of that daring enthusiasm which characterized him, to lay the curse of God upon him and his studies if he refused his aid to the church of Geneva in her time of need. This seemed to Calvin a divine menace. "It was," he said, "as if God had seized me by His awful hand from heaven." He yielded, and joined eagerly with Farel in the work of reformation.

Such was the beginning of Calvin's great career in Geneva. Having abandoned his intention of pursuing his journey, he soon infused an energy into his task which crowned the struggling efforts of Farel with success. The hierarchical authority was already overturned before his arrival; the citizens had asserted their independence as against the Duke of Savoy, whose alliance with the ruling episcopate, which was the direct governing influence in the place, had called forth the patriotic as well as the religious feelings of the people. The magistrates and people eagerly joined with the reformers in the first heat of their freedom and zeal. A Protestant confession of faith was drawn up, approved of by the Council of Two Hundred, the largest governing board of the city, and then proclaimed in the cathedral church of St. Peter's as binding upon the whole body of the citizens. Great and marvelous changes were wrought in a short time upon the manners of the people; where license and frivolity had reigned, a strict moral severity began to characterize the whole aspect of society. The change, however, was too sudden and the strain was too extreme. A spirit of rebellion against the rule of Calvin and Farel broke forth. They, however, refused to yield to the wishes of a party animated by a more easy and liberal spirit than themselves (known in the history of Geneva under the nickname of Libertines); and the consequence was that they were both expelled from the city after less than two years' residence (April 23, 1538).

Calvin turned to Strassburg, where he had meant to go when arrested in his course in Geneva. Here he settled, and devoted himself to theological study and especially to his critical labors on the New Testament. Here, also, in October, 1539, he married a member of his congregation, Idelette de Bure, widow of Jean Stordem, of Liège, an Anabaptist, whom he had converted, and who had died in February, 1538. The marriage appears to have proved a happy one. His wife bore him one child, a son, who, being born prematurely, died shortly after his birth. (Consult his letters to Viret of July and Aug. 19, 1542.) She herself died in April, 1549.

The Genevans found, after a short time, that they could not well do without Calvin. His rule might be rigid; but an authority even such as

his, which might prove galling in its severity, was better than no settled authority at all; and the Libertine party were unable to construct any efficient form of government. Accordingly the citizens invited Calvin to return; and after some delay on his part, in order to test the spirit in which they were acting, he acceded to their invitation, and on Sept. 13, 1541, after three years' absence, once more made his entry into Geneva.

Now, at last, he succeeded in establishing his plan of church government in all its forms and details. By his college of pastors and doctors, and his consistorial court of discipline, he founded a theocracy, with himself at the head of it, which aimed virtually to direct all the affairs of the city, and to control and modify both the social and individual actions of the citizens. Not without a struggle, it may be supposed, did he succeed in his great autocratic scheme. The Libertines, although dishonored by their ineffectual attempts to maintain order in the city and uphold its rights and dignity, still remained a strong party, and were even augmented after Calvin's return by such men as Amy Perrin, who had strongly concurred in the invitation to Calvin, but who were afterward alienated from him by the arbitrary way in which he pursued his designs, no less than by their own schemes of ambition. The struggle with these opponents lasted for no less a period than 15 years, and was only terminated in 1555, after a somewhat ridiculous *émeute* in the streets. Amy Perrin and others, driven from the city, were executed in effigy, and the reformer's authority from this date strengthened into an absolute supremacy.

During the period of this long struggle with the Libertines, Calvin had many other disputes, in which he displayed equal zeal. The most remarkable of these were his controversies with Sebastian Castellio, Jerome Bolsec, and, above all, Michael Servetus.

Calvin had become acquainted with Castellio in Strassburg (1540). They entertained at first a warm friendship for each other, and Calvin showed great zeal in assisting Castellio, whose poverty and learning had attracted his sympathy. When he returned to Geneva, he invited Castellio to join him there and procured for him the rectorship in the Latin school of the city. There was little similarity, however, in the characters of the two men, and the diversity of their tastes and views soon became apparent. The learning of Castellio was intensely humanistic and opinionated. As soon as he began to apply himself to theology, he came into conflict with Calvin. In a letter to Viret, September 11, we find Calvin speaking of "the freaks of our friend Sebastian, which may both raise your bile and your laughter at the same time." These freaks relate to Castellio's notions of scriptural translation, and his refusal of Calvin's offer to revise the version which he had made of certain parts of Scripture. Then, two years later, when Castellio desired to enter the ministry, Calvin dissuaded the council from accepting him, on account of some peculiar opinions which he held. These were certain rationalistic views as to the authenticity and character of the Song of Solomon, the descent of Christ into hell, and also about election. After this, Castellio left Geneva for a while, but, soon returning, he attacked the views of Calvin openly (consult Calvin's letter to Farel, May 30, 1544), and was forced to leave

the city. The two old friends, now declared enemies, did not spare each other henceforth. Castellio died in Basel Dec. 29, 1563. (For his biography, consult F. Buisson, Paris, 1892.) The fate of Servetus drew forth an anonymous publication attacking with keen logic and sarcasm the Genevan doctrines. This publication was attributed by both Calvin and Beza to Castellio, and they replied to him in no measured terms, stigmatizing him as a "deceiver and vessel of Satan." One fact really disgraceful to Calvin in the controversy ought not to be passed over. Sunk in great poverty, Castellio was obliged, in his old age, to gather sticks on the banks of the Rhine at Basel, as a means of support. Calvin did not hesitate to accuse him of stealing the sticks. Such polemical truculence is a sad sight in a great man.

The controversy with Bolsec belongs to a later period. Jerome Bolsec was originally a Carmelite monk, but had thrown aside the habit and betaken himself to the practice of medicine in Geneva. He was led to attack Calvin's doctrine of predestination. As soon as Calvin heard of this he gave him to understand that he was not at liberty to question the Genevan doctrine. After repeated disputations, Bolsec was found incorrigible and was sentenced to banishment from the city (Dec. 25, 1551). Cast out of the theocratic community, he ultimately rejoined the Roman Catholic church and revenged himself upon Calvin by writing his life in a spirit of detraction and slander (Lyons, 1577).

Of all these contests, however, the most memorable is that with Servetus. A melancholy interest surrounds the name of this great heretic. The character of Servetus himself has little to do with this interest. He seems to have been a vain, restless, and enthusiastic dreamer rather than a calm and patient inquirer. In his very dreams, however, and the vague audacities of his speculation, there is a kind of simplicity and unconscious earnestness that win sympathy. He had entered into various relations with Calvin even from the time of his early residence in Paris; particularly he had sent him various documents containing the views later expressed in his work *Restitutio Christianismi* (1553). Calvin never concealed his abhorrence of these views; and in a letter to Farel on Feb. 13, 1546, he says: "Servetus lately wrote to me. . . . He takes it upon him to come hither, if it be agreeable to me, but I am unwilling to pledge my word for his safety, for if he shall come, I shall never permit him to depart alive, provided my authority be of any avail." The history of his seizure and condemnation at Vienne by the Catholic authorities, and especially of Calvin's share in the correspondence which led to his seizure, is very complicated and obscure. It has been maintained that Calvin was the instigator of the whole transaction; it is certain that he forwarded to the authorities private documents which Servetus had intrusted to him, with a view to the heretic's identification and as materials for his condemnation. Servetus was sentenced to be burned, but effected his escape, and after several months' wandering was found in Geneva. It was his intention to proceed to Italy, where he hoped his opinions might meet with some degree of toleration, and he passed through Geneva on his way. Having ventured to attend church, according to the common account, he was recognized, apprehended, and conveyed to prison by Calvin's order, just as he

was about to leave the city. The particulars of his trial are full of interest, but too detailed to be given here. It lasted, with various interruptions, for two months. He attacked Calvin with the most foul epithets, and Calvin retorted in the same terms. At length, on Oct. 26, 1553, sentence was passed upon Servetus, condemning him to death by fire. Calvin used his influence to have the mode of death altered to decapitation, but without success. On the very next morning the sentence was put into execution. Whatever apologies may be urged for this memorable crime, it must remain a mournful blot on the history of the Reformation. The disgrace of it has particularly attached to Calvin, and with justice; but many of the other reformers are no less implicated in it. The wise Bullinger defended it, and even the gentle Melancthon could see only cause for gratitude in the hideous tragedy. See SERVETUS.

After the execution of Servetus, and the expulsion of the Libertines, two years later, Calvin's power in Geneva was firmly established, and he used it vigorously and beneficently for the defense of Protestantism throughout Europe. By the mediation of Beza he made his influence felt in France in the great struggle there going on between the hierarchical party, with the Guises at its head, and the Protestants, led by Condé and Coligny. In 1561 his energies began to fail. He had long been suffering, but his strength of will and buoyancy of intellect sustained him amid all his bodily weakness. In the year now mentioned, his health failed, and although he survived for more than two years, he never regained his vigor. He died in Geneva on May 27, 1564.

Very different estimates have been formed of Calvin's character, according to the point of view from which it is contemplated. None, however, can dispute his intellectual greatness, or the powerful services which he rendered to the cause of Protestantism. Stern in spirit and unyielding in will, he was never selfish or petty in his motives. Nowhere amiable, he was everywhere strong. Arbitrary and cruel when it suited him, he was yet heroic in his aims and beneficent in the scope of his ambition. Earnest from the first, looking upon life as a serious reality, his moral purpose was always clear and definite—to live a life of duty, and, in whatever sphere he might be placed, to work out the glory of God.

He rendered a double service to Protestantism, which, apart from anything else, would have made his name illustrious: he systematized its doctrine and he organized its ecclesiastical discipline. He was at once the great theologian of the Reformation, and the founder of a new church polity, which did more than all other influences together to consolidate the scattered forces of the Reformation and give them an enduring strength. As a religious teacher, as a social legislator, and as a writer, especially of the French language, then in process of formation, his fame is second to none in his age and must always conspicuously adorn the history of civilization. Among Calvin's most important works are: *Christianæ Religionis Institutio* (1536); *De Necessitate Reformandæ Ecclesiæ* (1544); *Commentaires sur la concordance ou harmonie des Évangélistes* (1561); *In Novum Testamentum Commentarii*; *In Libros Psalmorum Commentarii*; *In Librum Geneseos Commentarii*. The first edition of Calvin's whole

works is that of Amsterdam, 1671, in 9 vols., fol., but this has been superseded by the definitive and critical edition begun by J. W. Baum, E. Cunitz, and E. Reuss, and finished by Lobstein and Erichson (59 vols., Brunswick and Berlin, 1803-1900). Consult A. Erichson, *Bibliographica Calviniana* (Berlin, 1900). By the Calvin Translation Society, in Edinburgh, his works have been collected, translated into English, and issued in 51 vols., 1843-55. For his biography, consult: T. de Beza (Geneva, 1564; new ed., Paris, 1869), the original life, written a few weeks after Calvin's death; J. Bolsec (Lyons, 1577; new ed., 1875); and J. M. V. Audin (Paris, 1841; 6th ed., 1873), written from the Roman Catholic standpoint; P. Henry (3 vols., Hamburg, 1835-44), Eng. trans. abridged and altered by Stebbing (London, 1851); T. H. Dyer (London, 1850); F. Bungener (Paris, 1863, Eng. trans., Edinburgh, 1863); E. Staehelin (Elberfeld, 1863); A. Pierson (Amsterdam, 1883-91); W. Walker (New York, 1906)—all of which are written from the Protestant point of view. A very valuable and impartial book from a Roman Catholic is F. W. Kampshulte, *Johann Calvin, seine Kirche und sein Staat in Genf* (Leipzig, 1869-99). An exhaustive work is that of E. Doumergue (Lausanne, 1899-1908). It contains many illustrations from original drawings, facsimiles, etc., and is the work of a lifetime. Consult also the biography of Calvin by Philip Schaff in his *History of the Christian Church*, vol. vii, pp. 257-844 (New York, 1892).

CALVINISM. The system of thought deriving its name from its greatest representative, John Calvin (1509-64). The central idea of the system is the conception of the sovereignty of God. This is not merely that God is the final cause in the physical world, but that every movement towards the right in the heart of man proceeds from him.

This central idea is far older than Calvin. It found its first prominent exponent in Augustine (q.v.), though the sovereignty of God is a familiar thought even in the Hebrew writings. It took its Augustinian form in consequence of the discussions of the Pelagian controversy (see **PELAGIANISM**), in which the point at issue was the originating source of conversion. Pelagius maintained that this was in the free will of man; Augustine that it was in the prevenient grace of God, turning man's will towards the right. From this position developed the most distinctive features of Augustinianism: original sin, bondage of the will, inability to be good, predestination, and the reference of all good to God alone. The tendency of the course of discussion in the Middle Ages was to weaken the Augustinian system, but it was restored by the reformers, Luther, Zwingli, and Calvin. The latter incorporated it in his *Institutes* (final ed., 1559), which was a most logical system of Christian doctrine. Calvinism differs from Augustinianism in the following particulars: 1. Its conception of predestination. Augustine thought of this as a predestination to life. Calvin, following the idea to its logical issue, held that predestination must be both to life in some and to death in others. This is the doctrine of reprobation. Later Calvinists often shrunk from this doctrine and retreated to Augustine's position. 2. Its conception of regeneration. For Augustine this is accomplished in baptism; for Calvin, through the spirit of God, acting

secretly upon the heart of man. 3. Its conception of perseverance. Augustine held that one may fall from baptismal grace. He is elect who perseveres. Calvin held that God will keep those to whom he has given regenerating grace. He who is elect will persevere. The five points of Calvinism are election, redemption, bondage of will, grace, perseverance of the saints. The decisive element of the Calvinistic system is its doctrine of God. It lays emphasis upon the immutable nature of God, and upon His unchangeable attributes of justice and love, each equally sovereign. God's design in the creation of the world was the manifestation of His own glorious attributes, of which these are the chief. Accordingly He forms in eternity the plan upon which He conducts both creation and the government of the created world. He "foreordains whatsoever cometh to pass." Two schools have arisen as to the order of the divine decrees: one, the "Supralapsarian," looking to the final result as the first thing contemplated in God's decree, and making their order, therefore, creation, election and reprobation, the fall, redemption by Christ, and application of redemption by the Holy Spirit; the other, the "Infralapsarian," which seeks to avoid the impression gained from Supralapsarianism, that men are condemned before they are guilty, by making the order of decrees, creation, fall, election, redemption, etc. The Supralapsarian holds that God decreed that man should fall; the Infralapsarian, that God permitted man to fall. The latter has been the prevailing view among Calvinists, though many regard the difference as merely logical.

The decree of the fall is the decree that man shall sin; but all understand that sin is man's own act, and not that of God. All the decrees equally preserve the freedom of man. This theological proposition is explained by various theories of the will and of the psychology of moral action. None of these can be regarded as essential to the system, which is independent of its psychological explanation. The first sin, the sin of Adam, did not affect him alone, but involved the race in sin and guilt. Every member of the race is so connected with its first member (whether by divine constitution, by a realistic identity, or by federal representation) that all sin in and with him and are justly condemned for that sin. Thus Adam's sin is said to be "imputed" to his descendants. Imputation is either "mediate," that is because of original depravity, or "immediate," by which original depravity is the penal result of original guilt directly imputed. Original sin results in actual and individual sin. The consequence of all this is a total inability to be good and the absolute necessity of regenerating grace before any soul can repent and receive the divine forgiveness. Hence the electing grace of God cannot be conditioned upon the foreseen faith of the elect, because, apart from God's activity, and thus apart from His purpose to act in their behalf, or apart from election, they have no faith and can have none.

Grace is the favor of God shown to the undeserving. It is the execution of the decrees of God. God, in forming the decree of election, is sovereign; that is, the motive which leads Him to set apart a certain and fixed number of souls unto eternal salvation resides in Himself alone, and not in them. Grace is of three kinds: "Common" grace is bestowed upon all men, tends to good, and results in the various natural

virtues, such as kindness, honesty. "Prevenient," "effectual," or "irresistible" grace is that by which the soul is regenerated. By it the will is moved to holy action, and repentance and faith are produced. "Coöperative" grace works with the will thus turned to God and is the cause of what degree of actual holiness the Christian attains. Grace also includes the "gift of perseverance," which secures the perseverance and final salvation of the soul.

Calvin's Institutes, logical as the work was, yet left certain problems unsolved. 1. Did God decree the fall of man, and become, in a sense, the cause of sin? This produced the Supra- and Infralapsarian schools. 2. How is man so connected with Adam that he "sins in him"? Augustine met this by Platonic realism, but that was a philosophy no longer held. The federal theology (q.v.) was one of the attempts to solve this problem. 3. How can man's will be free, if God has decreed whatever comes to pass? New England Theology (q.v.) discussed this, ranging from Edwards's determinism to Taylor's free will.

Calvinism appears in most of the great Protestant confessions, except that of Augsburg; in the Heidelberg, French, Belgic, Synod of Dort (on occasion of the controversy with the Arminians, q.v.), and the remarkable series of English confessions, beginning with the *Articles of the Church of England* (first issued in 1552), embracing the Lambeth (1595) and the Irish (1615) articles, and concluding with the Westminster (1647). It was represented by a long series of divines, of whom Beza, Bullinger, Ames, Turretin, John Owen, Jonathan Edwards, Charles Hodge, and Kuyper may be mentioned. It is now the confessional theology of the Presbyterian and so-called "Reformed" churches in all the Protestant nations. In New England, under the influence of Edwards and his pupils, there arose a school of "consistent" Calvinists, who variously modified the details of the system, principally in consequence of a new psychology of the will and of virtue.

The adherents of Calvinism claim for it a great and decisive influence for good upon the history of the world. As the religion of the French Huguenots, of the founders of the Dutch Republic, of Scotch Covenanters, and of English Puritans, it has its heroic period to point to, and its roll of martyrs second to none. Bancroft, the historian of the United States, himself not a Calvinist, refers modern republican liberty to the influence of the little Republic of Geneva and to Calvinism. Its influence in promoting the independence of the United States was indisputably great. It has proved one of the chief forces in promoting the education of the common people and in fostering higher education in the modern world. And its efforts in the department of foreign missions during the last century led and surpassed those of other schools of thought.

For the essential sources in the study of Calvinism, consult: Bright, *Select Anti-Pelagian Treatises of St. Augustine* (London, 1880) for the Latin text, or Warfield's "Augustine's Anti-Pelagian Treatises," in *Nicene and Post-Nicene Fathers*, vol. v (New York, 1886-88); Calvin, *Institutio Christianæ Religionis*, ed. by Tholuck (Berlin, 1846); Eng. trans., *The Institutes of the Christian Religion* (Philadelphia). Best modern presentations: Charles Hodge, *Systematic Theology* (3 vols., New York, 1872);

W. G. T. Shedd, *Dogmatic Theology* (3 vols., New York, 1888). Expositions, A. A. Hodge, *A Commentary on the Westminster Confession of Faith* (Philadelphia, 1869); A. Kuyper, "Calvinism," *The Stone Lectures* (New York, 1898). See ARMINIANISM.

CALVINISTIC (or PARTICULAR) BAPTISTS. See BAPTISTS.

CALVINISTIC METH'ODISTS. A body in Great Britain in three divisions: the Whitefield Connection, 1741; Lady Huntingdon Connection, 1748; and Welsh Methodists, 1750. See PRESBYTERIANISM.

CALVISIUS, SETHUS (1556-1615). A German composer and theorist, whose real name was Kallwitz. He was born at Gorschleben, Thuringia, as the son of a poor day laborer. As a boy he earned enough with his beautiful voice to enable him to attend the gymnasium at Frankenhausen, and later the University of Leipzig. In 1581 he became musical director of St. Paul's in Leipzig. From 1594 until his death he was cantor of St. Thomas, which even before Bach's incumbency of the position was a very distinguished post. Calvisius was one of the greatest musical scholars of his time, and one of those whose investigations finally established Harmony as a separate branch from Counterpoint. His compositions include: The 150th Psalm for 12 voices; *Hymni Sacri*; *Tricinia* (1603); *Biciniorum libri duo* (1599, 1612); *Harmonia cantionum ecclesiasticorum a M. Luthero et aliis viris piis Germaniæ compositarum* (1597). His principal theoretical work is *Melopœia seu melodiarum condendæ ratio* (1582). Consult K. Benndorf, *Sethus Calvisius als Musiktheoretiker* (Leipzig, 1894).

CALVITIES. See BALDNESS.

CALVO, KIL'VÔ, CARLOS (1824-1906). An Argentinian diplomat and writer on international law. He was born in Buenos Aires and early entered upon a diplomatic career abroad. In 1860 he represented the Paraguayan government on a special mission to London and Paris. At the Ghent congress of 1884 he was one of the founders of the Institut de Droit International, and later he became the Ambassador of the Argentine Republic to Berlin and to France. As early as 1863 he took rank as one of the greatest modern authorities on the subject of international law, by the publication of his *Derecho internacional teórico y práctico de Europa y América* in 2 vols. At the same time he issued a French version thereof. By 1887-88 this first French version had reached a 4th ed. and been expanded to 6 vols. The 5th ed., also in 6 vols., appeared in Paris, 1896. Among his other principal works are the following: *Recueil complet des traités, conventions, etc., de l'Amérique latine* (15 vols., 1862-69); *Annales historiques de la révolution de l'Amérique latine* (5 vols., 1864-75); *Manuel de droit international public et privé* (3d ed., 1892). He formulated the so-called Calvo doctrine which provided that "the collection of pecuniary claims made by the citizens of one country against the government of another country should never be made by force." This principle became known also as the Drago doctrine, from Dr. Luis Drago, Argentinian Minister for Foreign Affairs, who first advanced it in 1902 when the fleets of Great Britain, Germany, and Italy were blockading the Venezuelan coast to compel the payment of certain claims by President Castro. The Pan-American Congress at Rio Janeiro in August, 1906, submitted the

question to the contemplated Hague Peace Conference.

CALVUS, GAIUS LICINIUS MACER (82-47 B.C.). A Roman lyric poet and orator, friend of Catullus (q.v.). As orator he is often praised by Cicero (*Brutus*, 280-285; *Ep. ad Fam.*, 15, 21). He was the chief supporter of the so-called Attic style of Roman oratory (see ORATORY); for his attitude here, which he regarded as narrow, Cicero criticises Calvus (*Brutus*, 284-291; consult also Quintilian, 10, 1, 115). Of the 21 speeches mentioned by ancient writers as delivered by him, the most famous was that against Publius Vatinius. According to Catullus, 96; Propertius, 2, 34, 89, his poems were full of learning and grace. The fragments of Calvus's writings have been collected by Plessis (Paris, 1896).

CALYCAN'THUS (from Gk. κάλυξ, *kalyx*, cup + άνθος, *anthos*, flower, referring to the cups enclosing the pistils). A genus of Calycanthaceae, a family of plants allied to Rosaceae. Only about four species are known. They are shrubs with opposite entire leaves and are natives of North America. They have an aromatic fragrance and in the genus *Calycanthus* the bark and leaves possess it as well as the flowers. The bark has acquired the name of Carolina allspice, or American allspice. The flowers are of a chocolate or dull-purple color. The four American species are found wild along the Alleghanies, in Pennsylvania, Virginia, etc., except *Calycanthus occidentalis*, with brown flowers, which grows in California only.

CALYDON (Gk. Καλυδών, *Kalydōn*). An ancient city of Ætolia, 7½ Roman miles from the Ionian Sea, on the river Evenus. It was celebrated in Greek legend as the home of Meleager, Tydeus, and other heroes. (See CALYDONIAN BOAR.) In 391 B.C. it was in possession of the Achæans and was of strategic value in the war between Cæsar and Pompey. In 31 B.C. Augustus removed the inhabitants to Nicopolis, founded to commemorate the victory of Actium (q.v.). The site is generally believed to be at the Kastro of Kurtagā; there walls are to be seen, with a circuit of over 2 miles, on a hill on the bank of the Evenus. Consult Woodhouse, *Ætolia* (Oxford, 1897).

CALYDON. A great forest, supposed to have once existed in the north of England and mentioned in Arthurian romance.

CALYDONIAN BOAR. According to a Greek myth, a certain Ceneus, King of Calydon, in Ætolia, omitted a sacrifice to Artemis, whereupon the goddess in her rage sent into his fields a frightful boar, which committed great devastation. No one had the courage to hunt it except Meleager, the son of Ceneus, who, calling to his help the bravest heroes of Greece—Theseus, Jason, Nestor, and others—pursued and slew the monster. This hunt is a favorite subject in Greek art and was represented in the pediment of the Temple of Athena Alea at Tegea by the great sculptor Scopas; some fragments of this pediment are now in Athens. Consult E. A. Gardner, *A Handbook of Greek Sculpture*, pp. 378-381 (London, 1911).

CALYMMENE, or **CALYMENE**, ká-lím-'ē-nē (Gk. κεκαλυμμένη, *kekalymmenē*, fem. perf. part. of κάλυπτεν, *kalyptein*, to cover; refers to the thorax and shield). A genus of fossil trilobites characteristic of the Silurian system. It has a rather long body, of oval form, with a semicircular head shield and a thorax of 13 segments.

The tail shield is lobed like the thorax and is not clearly distinguishable from the latter. About 60 species of *Calymmene* have been described from the Silurian and Ordovician strata, and the largest have been found in the lower Devonian rocks. *Calymmene blumenbachi* and *Calymmene senaria* are prominent species.

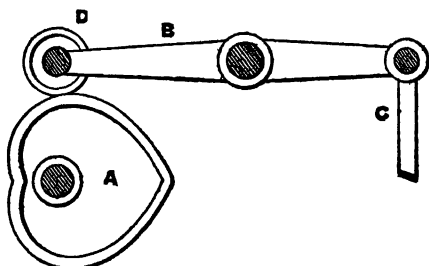
CALYPSO (Gk. Καλυψώ, *Kalypsō*). In Grecian legend, a nymph, dwelling alone on a remote island, who rescued the shipwrecked Odysseus, and kept him with her seven years, promising him immortality, but unable to make him cease his longing to return to Ithaca. She finally yielded to a command of Zeus, brought by Hermes, and allowed him to depart on a raft of his own building. She then died of grief. Calypso is a somewhat late addition to the Odysseus story; outside of the Homeric poems she is merely a name.

CALYP'TRA (Gk. καλύπτρα, *kalyptra*, from κάλυπτεν, *kalyptein*, to conceal). A term commonly applied to the enlarged and ruptured archegonium (female organ) of the true mosses, which is carried up as a loose hood, capping the spore case. Its application is extended, however, to include any development of the archegonium which follows fertilization. See MUSCII.

CALYX (Lat., Gk. κάλυξ, *kalyx*, cup of a flower, from κάλυπτεν, *kalyptein*, to cover). In flowers, the outer and sometimes the only set of floral leaves. The individual parts are called "sepals." The sepals are usually green and leaf-like and serve to protect the more delicate inner parts of the bud, but sometimes they are very much modified. See FLOWER.

CAM, kām (Kelt., crooked), or GRANTA. A river which rises in Essex, England, and is known as the Granta until it joins with the Rhee, 3 miles above Cambridge, to which city it gives its name. After a northeasterly course of about 40 miles through Cambridgeshire, it joins the Ouse, 3½ miles above Ely. It is a favorite boating river, famous in connection with the boat races of the students of Cambridge University.

CAM (dialectic form of W. I. Gael. *kam*, crooked, or unsymmetrical). A mechanical device for transforming a rotative motion, as around an axis, into a reciprocating one, or a translation, usually at right angles to the axis. The more common form of the cam is a disk or short cylinder whose external or cylindrical



CAM.

elements are at different radial distances from the axis around which the cam revolves. In the figure, e.g., as the cam disk A is revolved by the shaft to which it is keyed or otherwise secured, the roller D is compelled to move to distances farther from the axis of the shaft, or to return to positions nearer to such axis as the profile of the face in contact with the roller passes under the latter. The form shown is called the

"heart cam" from its symmetrical profile, which is that of two geometrical spirals back to back. These curves give a uniform motion of advance and return to the valve rod *C* or other mechanism which it may operate. Any profile may be given to the cam, which will produce any desired motion of the pivoted lever *B* and attached rod *C*. As shown, the motion of *C* in one direction takes place in one-half revolution. But the rates of ascent and return may be different; or the rod may be held stationary during a part of the revolution and then released suddenly to drop by its weight, or helped to rapid motion by a spring. Cams are much used in printing presses and automatic machines such as typesetting in order to produce quick sudden motions properly timed in relation to others to which these motions are to be definitely related, with stationary intervals or halts between. They are used in valve gears of many kinds, particularly in internal combustion motors, where there must be openings of inlet and exhaust valves at the beginnings of certain strokes of the piston, and a closure during other strokes. Such cams have a gradually changing profile on the opening face and an abrupt face for the closing side.

The cam shown is an external cam and operates by pushing. The roller can be fitted to a groove in the face or side of the disk: it then becomes a box cam and operates both by pushing and pulling. The roller has to reverse its motion when the direction of radial motion changes, and hence becomes noisy by wear. The varying profile may be made on the edge of the face of the cam, so that the motion of the roller *D* becomes parallel to the shaft. Variable cams have the actuating profile different in different planes at right angles to the shaft. By sliding the cam along the shaft under the roller these various profiles become the driving faces, and a different motion of roller *D* and rod *C* results from a uniform revolution of the cam shaft. Cams sometimes do not revolve continuously, but have a rocking or oscillating motion, such as appears in the valve gear of most beam engines which drive the paddle wheels of smooth and shallow water boats. The ordinary eccentric disk, or true cylinder revolving around an axis not in its centre of figure, and actuating a rod by means of a strap surrounding the cylindrical disk, is not properly a cam. Also, when what has been heretofore the cam and the roller are fitted with gear teeth and mesh together, the combination is to effect some other purpose, and the eccentric gear ceases to be properly called a cam. An important application of the cam is in the crushing of gold ores where the gravity stamp has been used for centuries. The stamp or stem is raised by a cam the surface of which is an involute of a circle having a radius equal to the distance between the centres of the stamp stem and the cam shaft.

CAM, kǎn', or **CÃO**, koun, **DIAGO**. A Portuguese navigator who flourished at the end of the fifteenth century, and continued the African discoveries inaugurated by Prince Henry the Navigator. In voyages made in 1482-84 and 1485-86, he sailed along the west coast of Africa as far as the Congo and then on down to Cape Cross. At four points he erected pillars, all of which have since been discovered where he placed them. The inscriptions on the two from Cape Santa María and Cape Cross, dated 1482 and 1485 respectively, have been found legible and

have been published. The pillar from Cape Cross is now at Kiel (its place having been taken by a granite facsimile), and the others are in the Museum of the Lisbon Geographical Society. On Cam's return from his first voyage, his grateful sovereign, Joan II, ennobled him (April, 1484). He had sufficient influence with one of the Congo chiefs to induce him to permit the establishment of Christianity among his people.

CAMAGÜEY. See **PUERTO PRINCIPE**.

CAMATEU, **CAMAYEU**, *Fr. pron. ká'má'yé'*, or **MONOCHROME** (*Fr. camaieu*, *cameo*, a painting in one color, usually called monochrome (q.v.)). Paintings of several tints, but where the natural colors of the object are not copied, are said to be *en camayeu*. The term is also applied to wood engravings imitating pencil or pen and ink drawings.

CAMAJUANI, kǎ'má-Hwǎ'nǎ. A city of Cuba, in the Province of Santa Clara, about 20 miles from the north coast of the island (Map: Cuba, F 4). It is connected by rail with Havana, Cardenas, and the coast. Pop., 1899, 5082 (municipal district, 14,495); 1907, 5316 (municipal district, 14,583).

CAMALDOLITES. A religious order, founded in the vale of Camaldoli (Neo-Lat. *Campus Madoli*), near Arezzo, in the Apennines, in 1012, by St. Romuald (c.950-1027), a Benedictine monk, and a member of the family of the dukes of Ravenna. It soon spread through Italy. The brethren, who wear white garments, are, and have always been, characterized by the excessive rigidity of their monastic rule. The order has greatly declined, but still has several monasteries in Italy, one in Poland, and one in Brazil. Its greatest ornaments have been Gratian, the great canonical jurist of the twelfth century, and Pope Gregory XVI (1831-46). There was an order of nuns of the name, which now has five convents in Italy.

CAMALIG, kǎ'mǎ'lég. An inland town of the Philippines, in the Province of Albay, Luzon. It lies 6 miles west-northwest of Albay, the capital, in a plain near the source of the Juaya River. Hemp growing is the leading industry. Pop., 1903, 14,153.

CAMARACUM. See **CAMBRAI**.

CÁMARA Y LIBERMOORE, kǎ'mǎ-rá & lǎ'nǎr-mò-ó'rǎ, **MANUEL DE LA** (1836-). A Spanish naval officer. He was born in Málaga, graduated at the naval academy in San Fernando, and served in the Mexican campaign as staff officer of the French general, François Jurién de la Gravière, and later acted successively as lieutenant on the *Vencedora* and sailing master on the *Villa de Madrid*. He subsequently was a leader in the campaign against Peru and Chile, and in the struggle with Cuba (1868-78), and, with the rank of captain, commanded a squadron in the Philippines. He was then appointed chief of the naval commission to the United States and London, and as rear admiral commanded the squadron dispatched to the Philippines during the progress of the Spanish-American War. This squadron, consisting of the *Pelayo*, *Cárlos V*, *Audaz*, *Osado*, *Proserpina*, *Rápido*, *Patriota*, *Buenos Aires*, *Isla de Panay*, *Colón*, *Covadonga*, and *San Francisco*, sailed from Cadiz, with 3000 soldiers, on June 16, 1898, and had already passed the Suez Canal en route for the Philippines, when the news of the destruction of Cervera's fleet compelled it to

return. Later he was chief of the training ships and captain general of the Department of Ferrol. He became vice admiral in 1903, and retired in the same year.

CAM'ARAL'ZAMAN. A prince in one of the tales of the *Arabian Nights* who fell in love with the Princess Badoura as soon as he caught sight of her.

CAMARGUE, ká'märg', ISLE DE LA. See BOUCHES-DU-RHÔNE.

CAMARILLA, ká'má-rē'lyá (Sp., little room, from Lat. *cámara*, vault). As *cámara* is used to designate the chamber of the King of Spain, the royal chamber, so *camarilla* is used to designate his private chamber or cabinet, the place where he receives his most intimate friends, courtiers, and sycophants. In the political language of modern Europe it has come to signify the influence exercised on the state by secret and unaccredited counselors, in opposition to the opinions of the legitimate ministry. The *camarilla* is an old institution in Spain, but the word first began to be widely used in the time of Ferdinand VII.

CAMARINA, ká'má-rē'ná (Gk. *Καμάρινα*, *Kamárina*). A ruined city in Sicily, about 5 miles in circumference, about 100 miles southwest of Syracuse, not far from the sea, and 17 miles southeast of Gela (q.v.). It is east of the Camarina (ancient Hipparis) where, on a sand hill 100 feet high, now stands the chapel of the Madonna di Camarina. It was founded by Syracuse in 599 B.C., destroyed in 553 for rebellion, rebuilt by Hippocrates of Gela in 492 after the battle of the Helorus, again depopulated in 484 by Gelon, who transferred the inhabitants to Syracuse, and again colonized from Gela in 461. In 405 Dionysius compelled the inhabitants to accompany him on his retreat, and it was destroyed by the Carthaginians. In 339 it was recolonized by Timoleon, and in 258 fell into the hands of the Romans, who sold most of the citizens into slavery. In 853 A.D. it was destroyed by the Saracens, who left only the ruined walls and temples that now attest its ancient splendor.

CAM'ASS BAT (Am. Indian). The pocket rat of the northwestern United States, which feeds mainly on the camass (*Camassia esculenta*). See GOPHER.

CAMAYEU. See CAMAIETU.

CAMBACÉRÈS, kán'bá'sá'rēs', JEAN JACQUES RÉGIS, DUKE OF PARMA (1753-1824). A French statesman. He was born in Montpellier and became a member of the Convention, where his judicial training at once brought him into prominence. His moderation in the midst of stirring events was soon manifested, particularly in his attitude towards the condemnation of the King. After the fall of Robespierre he succeeded for a short time to the presidency of the Convention, and he at once began working for peace at home and abroad. Forced from office, he devoted himself to his *Projet de code civil et Discours préliminaire*, from which the Code Napoléon was derived. In October, 1796, he became President of the Council of Five Hundred, and in June, 1799, Minister of Justice. After the eighteenth Brumaire (Nov. 9, 1799) he became Second Consul under Napoleon, who, on ascending the throne, made him High Chancellor of the Empire and in 1808 Duke of Parma. In 1813-14, while Napoleon was absent in the field, Cambacérés directed

civil affairs as President of the Council of Regency, finally voting for Napoleon's abdication, but during the Hundred Days he reluctantly served Napoleon as Minister of Justice and President of the House of Peers. After the Second Restoration Cambacérés returned to Paris, but was exiled in 1816 as a "regicide." His legal and political rights were restored to him in 1818. He took no part in public life afterward and died March 8, 1824.

CAMBALUC, kám'bá-lóok', or **CAMBALU**, kám'bá-lóo' (Mongol *Khan-Baligh*, city of the Khan). The former name of Peking (q.v.), China.

CAMBAY' (Hindi *Khambāt*, from Skt. *kham-bavatī*, possessing pillars). The capital of the native State of Cambay, Gujerat, India, standing at the head of a gulf of the same name, on the right bank of the Mahi, 76 miles to the north-northwest of Surat (Map: India B 4). Pop., 1901, 31,870, although it was at one time much more populous. Portions of a great brick wall which once surrounded the city, ruined palaces, mosques, and tombs, and an excavated temple of considerable pretensions, attest its former magnificence. It was one of the ports visited by Marco Polo in 1293. The gradual filling in of the gulf has contributed to its decline. The export of cotton is the staple trade and it has celebrated manufactures of onyx, agate, and carnelian ornaments. Pop. of the State of Cambay in 1891, 89,722; 1901, 75,225.

CAMBERT, kán'bär', ROBERT (c.1628-77). A French composer. He was organist of the church of St. Honoré, and musical superintendent to Anne of Austria, the mother of Louis XIV. At the suggestion of the Abbé Perrin, he composed *La Pastorale* (1659), regarded as the first French musical comedy. Cambert may therefore be considered as the founder of French opera. Under the favor of Louis XIV and Mazarin, the *Pastorale* was followed by *Ariane et Bacchus* (1661), *Pomone* (1671), and *Les peines et les plaisirs de l'amour* (1672). Together with Perrin, who furnished the text for his operas, Cambert became director of the first French opera house, the Paris "Académie Royale de Musique," but was soon superseded by his rival Lully. After Lully became musical superintendent to the King, Cambert went (1673 or 1674) to London, where he became master of the music to Charles II.

CAM'BERWELL. A parliamentary borough of London, situated south of the Thames.

CAMBERWELL BEAUTY. The English name for the widespread butterfly *Vanessa*, or *Euvanesa antiopa*, called in the United States "mourning cloak."

CAMBEVA. See OMAGUA.

CAMBIER, kán'byá', ERNEST (1844-1909). A Belgian explorer, born in Ath. In 1877 he accompanied the first expedition of the African International Association (q.v.) as astronomer and geographer, and upon the death of Crespel became chief of the expedition. He penetrated from Bagamoyo into the interior, proceeding to Unyamwezi, and to Karema on Lake Tanganyika, where, in September, 1879, he established the first post and scientific station of the International Association. He returned to Europe in 1882. He published (1879) a report of the expedition. Consult Wauters, *Le capitaine Cambier* (Brussels, 1881).

CAM'BIUM (Neo-Lat., from ML. *cambire*, to exchange). The name of a peculiar kind of

dividing cells (meristem). Any cells that are dividing and producing new cells are said to be meristematic, but ordinarily they produce cells that are uniform in kind. The peculiarity of the meristematic cells called "cambium" is that they produce different kinds of cells. The most familiar cambium is the plate of actively dividing cells that occurs between the xylem (wood) and phloem (cast) of dicotyledons and gymnosperms. This cambium produces new xylem cells on one side (inside) and new phloem cells upon the other side (outside). Another well-marked cambium is the cork cambium (phellogen), which is developed in the cortex of shrubs and trees, and produces upon the outside cork cells which give character to what is known as the outer bark. This cork cambium also produces another kind of cells within. See BARK and MORPHOLOGY.

CAMBODIA (Skt. *Kambōja*). A kingdom, once powerful, of southeastern Asia; since 1863 a French protectorate, and now part of French Indo-China. Cambodia is bounded on the north by Siam, on the west by Siam and the Gulf of Siam, on the south by the Gulf of Siam and Cochin-China, and on the east by Annam. It is crossed somewhat south of the middle by the parallel of 12° N. Its area is 67,741 square miles, inclusive of the territory acquired from Siam under the terms of the Franco-Siamese Treaty of March 23, 1907. The country is heavily timbered. The northern and northwestern portions of the Khmer Kingdom contain detached ramifications from the Central Asia Plateau—the wooded chain of Phnum-Dangrek, in the north of the Province of Kom Pong-Toat; to the south, Phnum-Dek; to the west of Tonlé-Sap, the Phnom-Prsat and the Phnom-Krevanh. The great waterway is the navigable Mekong, which annually overflows and richly fertilizes a wide territory. It divides at Pnom-Penh into two branches, the Tien-Giang and the Hau-Giang. An arm, the Tonlé-Sap, connects the Mekong with an extensive lake, called also Tonlé-Sap, though by the French the term ("river of Sweet Waters") is reserved for the stream and the names "Great" and "Little" are given to the two divisions of the lake. The waters of the Mekong back up into the lake through the Tonlé-Sap during the wet season; during the dry, the lake drains into the river through the same arm.

Despite the fact that Cambodia is in the torrid zone and on the whole a low-lying region, its climate is not so intolerably hot as might be expected, the heavy rains moderating the temperature. The main climatic features are determined by the monsoons. There are two seasons, the wet and the dry. Fever prevails in the mountain regions, which are in general less healthful for whites. The flora and fauna are characteristic of the Indo-Chinese region. Tigers, leopards, and elephants are found in many sections. Gold, silver-bearing lead, copper, slate, iron, and lime exist, but only the last two are profitably available. The fisheries form a notable industry, both along the islands of the coast and on the Tonlé-Sap (q.v.), where the fishermen are almost exclusively Chinese, Annamites, and Malays.

Agriculture is the leading occupation. The well-populated river plains and islands produce rice, the main food of the country. Cotton, tobacco, pepper, cardamoms, beans, sugar cane, maize, indigo, the mulberry, coffee, cacao, and vanilla are grown. Grazing is practiced. Some

80 kinds of valuable wood are found, such as ebony, rose, sapan, and pine. The gathering of these woods, together with palm sugar, wax, and gum, forms a noteworthy branch of industry. Silk weaving is a large domestic occupation. There are factories for shelling cotton seeds near the capital, Pnom-Penh (q.v.), a city of 54,621 inhabitants in 1911, situated in the heart of the country. Cambodia has no seaport of commercial importance, Kampot having merely a local or inland trade. Generally speaking, however, easy communication is had, both by land and by water, with the interior. Telegraph lines connect the principal towns with each other. But there are no railways, no modernized facilities for transporting articles of commerce. The export and import trade is through Saigon, the capital of Cochin-China. The exports include chiefly rice, salt fish (to the value of from 250,000 to 340,000 piasters annually), cotton, tobacco, gum, and wood. The imports embrace silk stuffs, salt, wine, opium, textiles, and arms.

Cambodia, founded upon the ancient kingdom of the Khmers, has been under French protection since 1863, when a French adviser was sent to the court of King Norodom, to prevent the permanent establishment of Siamese influence. Siam had previously exercised great power in the country, dating from the Siam-Annamese Treaty of 1846 which put an end to the strife of these two rivals for its possession. In 1866 Norodom transferred his capital from Oudong to Pnom-Penh, and the following year a Franco-Siamese treaty definitely established French protection. In 1904 Cambodia acquired from Siam Melupré, Bassac, and Krat; but the last was restored to Siam in 1907 in exchange for Battambang, Siem-Reap, and Sisophon.

The government is nominally in the hands of a king, aided by five ministers. The native functionaries are appointed by the king with the approval of the local French officials, who are under the direction of the Governor-General of French Indo-China, who is represented by a resident. The reigning King, Sisowath, succeeded his brother Norodom in 1904. The local budget is estimated at \$658,300, including \$133,300 for the civil list. The population in 1911 was 1,487,948; nearly four-fifths live in the river regions.

Outside of recent Annamite and Chinese immigrants and a considerable body of Malays, the population of Cambodia consists mainly of the Cambodians proper, or Khmers, formerly widespread over much of Indo-China, to whose half civilization belong the wonderful architectural remains of Angkor (now in Siamese territory), etc.; the Penong, or "savages," of the eastern table-lands and mountains, belonging, with the Moïs of the adjacent regions, to a primitive element of the population; the Khoïs, or Kuis, another aboriginal group in the northwest; and lastly, the Tsiam, or Chiam, in the south, who seem to be the survivors of the extinct empire of Champa, once dominant over all eastern Indo-China. All these peoples are now considerably mixed (the Khmers most, the mountain aborigines least) with Aryan (Hindu), Dravidian, Malay, and Tibeto-Chinese blood; and the Hindu influence (the alphabet of the Cambodians and the sacerdotal vocabulary are of Pali origin) predominates in religion, art, and literature among the more civilized sections. The Penong are rather short, dolichocephalic, much lighter-skinned than the surrounding peoples; the Khoïs, darker-skinned, taller, and inclined

to be short-headed; the Tsiam, dark-skinned and rather handsome in form and features, with some negroid suggestion in hair, etc. The Khmers are taller and less Mongoloid in appearance than the Annamese, Siamese, and closely related peoples. In speech the Penong and Khois probably represent a primitive variety of Indo-Chinese stock. The Khmer language differs in certain marked respects from the latter, and, like that of Tsiam, is said to have Malayan affinities, but this is not clearly made out, and the speech of the Khmers is largely *sui generis*. Buddhism is the prevailing religion. Some of the Tsiam profess Islam. Christianity and education have scarcely made a beginning. The Khmers are peaceful and teachable, but phlegmatic. Polygamy is practiced, but not more than three wives are permitted. The dwellings are mostly along the river banks. Slavery has almost disappeared, having been abolished in 1897 by royal ordinance. (See *KHMERS*.) Father W. Schmidt, in his *Die Mon-Khmer-Völker* (1906), has sought to establish the Mon-Khmer peoples as a link between the peoples of Central Asia and those of the Indo-Pacific area.

That Cambodia was once an extensive and powerful state and under a much higher grade of civilization than at present is shown by the superb architectural remains, the ruins of Angkor being especially noticeable. The early history of Cambodia, like that of Siam and Annam, with whose fortunes its own were often closely connected, is extremely obscure; but legend would seem to point to India as the source of the earliest migrations into the country. From Chinese notices it is known that a kingdom of Cambodia was already in existence not very long after the beginning of the Christian era, and that, after a short period of submission to China, in the sixth or seventh century, it attained to a high degree of splendor. With the beginning of the fourteenth century the period of decadence set in, the kingdom grew exhausted in continuous warfare against Siam and Annam, and was forced to pay tribute to each in turn, or to both. The first Europeans in Cambodia were the Portuguese, who founded a mission there in 1553. The attempts made by the Dutch and the English to establish themselves in the region proved unsuccessful, and when the French first turned their attention to the land, in the middle of the nineteenth century, European influence was non-existent there.

Consult: Verschuur, *Aux colonies d'Asie et dans l'Océan Indien* (Paris, 1900); Lagrillière-Beauclerc, *A travers l'Indo-Chine, Cochinchine, Cambodge, Annam, Tonkin, Laos* (Paris, 1900); Leclère, *Cambodge, contes et légendes* (Paris, 1895); id., *Recherches sur la législation cambodienne: Droit privé* (Paris, 1890); *Droit public* (1894); *Législation criminelle* (1894); Wake, "Les Cambodgiens et leur origine," in the *Revue d'Anthropologie* (1886); Bergargne, "L'Ancien royaume du Campa," in the *Revue Asiatique* (1888); Fournereau, *Les ruines khmères* (Paris, 1890).

CAMBODIA RIVER. See *MEKONG*.

CAMBOGE, kām-bōj'. See *GAMBOGE*.

CAMBON, kām'bôn', JULES MARTIN (1845-). A French legislator and diplomat, brother of Pierre Paul Cambon. He was born in Paris and began the practice of law in 1866. After serving in the war of 1870-71, he was auditor of the provisional commission appointed in 1871 to replace the Council of State. In

1874 he became Director General of the civil affairs in Algeria; in 1879, Secretary General of the Prefecture of Police in the Department of the Seine; and in 1891, Governor-General of Algeria. He was Ambassador of France at Washington 1897-1902, and acted for Spain in the preliminaries of peace after the Spanish-American War. In 1902 he became Ambassador at Madrid, and in 1907 at Berlin, where he did much to tide over the Agadir crisis of 1911. He resigned in December, 1913.

CAMBON, PIERRE JOSEPH (1754-1820). A French financier and politician. He was born in Montpellier, and was a merchant there at the beginning of the French Revolution. He was a member of the Legislative Assembly in 1791, and its last President, and a member of the Convention in 1792. He devoted himself to financial questions, of which he speedily showed himself a master. The financial condition was desperate, due to the excessive number of assignats in circulation and their consequent depreciation, and also to the general ignorance as to the actual debt of the country. Cambon proposed, in his great *Rapport sur la dette publique* (Aug. 24, 1793), to prepare a "grand livre" of the national debt. He was a member of the first Committee of Public Safety. Throughout the Reign of Terror he was the real administrator of the finances. He opposed the financial measures of Robespierre, who attacked him by name in the Convention. Later he was accused of having defended Callot d'Herbois and other members of the Committee of Public Safety, and had to leave France, but returned after the general amnesty of 1795. In 1815 he sat in the Chamber during the Hundred Days. He was finally exiled as a regicide in 1816, and he died near Brussels.

CAMBON, PIERRE PAUL (1843-1924). A French legislator and diplomat, born in Paris. He became Chief of Cabinet of the Prefecture of the Seine, under Jules Ferry, in 1870, and thereafter Secretary General of the departments of Alpes-Maritimes and Bouches-du-Rhône (1871), and Prefect of Aube (1872). After holding several other prefectures, in 1882 he entered the diplomatic service, and was Minister of France to Tunis, then Ambassador to Madrid (1886), to Constantinople (1891), and to London after 1898. The Anglo-French entente was in large measure due to his diplomatic skill. Late in 1913 he announced that he would soon retire.

CAMB'ORNE. A market town of Cornwall, England, 10 miles west-northwest of Falmouth. It is surrounded by very productive copper, tin, and lead mines. Its parish church is a handsome Gothic structure. Pop., 1901, 14,700; 1911, 15,829.

CAMBRAI, or **CAMBRAY**, kām'brā'. A town of France in the Department of the Nord (French Flanders), situated on the right bank of the Scheldt, 121 miles by rail north-northeast of Paris (Map: France, N., J2). It is well built, and has a fine cathedral containing the remains of Fénelon, Archbishop of Cambrai, a magnificent town hall, and a number of other fine buildings. Cambrai is the seat of an extensive textile industry, and contains, besides, a number of sugar mills, soap factories, tanneries, and many other industrial establishments. Cambrai was known to the Romans under the name of Camaracum, and it was then one of the chief cities of the Nervii. It was fortified by Charlemagne

and was long governed by its own bishops. Here was formed in 1508 the celebrated League of Cambrai, consisting of the Pope, the Emperor of Germany, and the kings of France and Spain, whose object was the destruction of the Republic of Venice. Here, also, was concluded in 1529 the peace between Francis I and Charles V, known as the *Paix des Dames* ('Ladies' Peace'), the preliminary negotiations having been conducted by Louise, mother of the French King, and Margaret, aunt of the German Emperor. Cambrai has been in possession of France since 1677. Consult Bouly, *Histoire de Cambrai et du Cambrésis* (Cambrai, 1843), and Dinaux, *Bibliographie Cambrésienne* (Douai, 1822). Pop., 1896, 14,306; 1901, 18,415; 1906, 21,791.

CAM'BRIA. The ancient name of Wales, the Britannia Secunda of the Romans. The name is derived from that of the Cimbri, or Cymri, by which the Welsh have always called themselves.

CAM'BRIAN SYSTEM. The name given to the great series of sedimentary deposits which comes next in order of succession to the Pre-Cambrian, the lower beds of the Cambrian system resting unconformably on its upturned edges. It is the earliest series of strata that exhibits a connected and orderly assemblage of fossil life forms. The name "Cambrian," derived from "Cambria," the ancient name of Wales, in which country the beds of this age were first recognized, was given by Adam Sedgwick, an eminent English geologist, who devoted his life to the study of this formation. The upper limits of the Cambrian, as there studied, were in much dispute for a time, since many of the beds placed by Sedgwick in the Upper Cambrian were claimed by Murchison to be Lower Silurian; and this, indeed, was subsequently found to be the case. To these disputed beds the name "Ordovician" was given by Lapworth (1879). Fossils are very scarce in the Cambrian rocks in many places, but in other localities, where different members of the formation are exposed, life remains abound, showing a profusion of marine invertebrates and plants of low order. The animal remains include, in order of their importance, crustaceans, brachiopods, pteropods, worms, gastropods, hydrozoans, echinoderms, sponges, corals, lamellibranchs, and cephalopods. All of these, except the cephalopods, were represented in the earliest periods of the Cambrian system.

While the great thickness of Cambrian strata indicates a long period of sedimentation, still the great changes that we find in the faunas in passing from one division of the Cambrian system into another are considered remarkable, since they indicate a most complete revolution in the life forms in any one region. Thus, of the many trilobites found in the Lower Cambrian, but few are known in the middle division; and these, in turn, differ markedly from those in the Upper Cambrian. The reason for this absence of transitional types may be due to the fact that the intermediate beds containing them have not yet been discovered. The trilobites were a prominent feature of the Cambrian system, and varied much in size, from under an inch, like the small, blind ones, as *agnostus*, to others having a length of 2 feet, as *paradoxides*. No vertebrate remains have been found. There is no evidence of invertebrate life that existed on land in fresh water, although it is quite possible that some of the mollusks found may have

lived in estuaries of brackish water, for the character of many of the sedimentary rocks of Cambrian time, such as grits, with ripple marks, is indicative of shallow-water conditions.

The thickness of the Cambrian system is variable. In Newfoundland it is about 6000 feet; in Vermont and eastern New York, 7000 feet; in British Columbia it has been reported at 40,000 feet. The Cambrian rocks include sandstones, limestones, shales, slates, marbles, and quartzites, with occasional igneous rocks, as in southeastern Pennsylvania, and also in Great Britain. The sediments for the most part have the characteristics of shallow-water deposits, laid down on the shores of a gradually sinking land surface. The metamorphosed Cambrian rocks are found in areas of much-folded strata. In America the Cambrian rocks have been classified under: (1) *Georgian* series, or Lower Cambrian; in this the trilobite *olenellus* is often common. (2) *Acadian*, or Middle Cambrian, in which the trilobite *paradoxides* is abundant in places. (3) *Potsdam*, or Upper Cambrian; with the *olenus* fauna.

In North America Cambrian rocks are found in Newfoundland and Eastern Canada; also in New England and along the flanks of the Appalachians to Alabama, in Wisconsin, South Dakota, California, Colorado, Arizona. They are also known in Great Britain, Germany, Bohemia, Scandinavia, France, Spain, Sardinia, China, Australia, and India. The British, Bohemian, and Scandinavian areas are of classic interest. The economic products of the Cambrian system in the United States include the slates (q.v.), manganese, and limonite ore (q.v.) of the Appalachian States; sandstone in New York, and gold in the Black Hills.

Consult: Walcott, *Tenth Annual Report United States Geological Survey* (Washington, 1888); *Bulletin 81, United States Geological Survey* (Washington, 1891); Dana, *Manual of Geology* (New York, 1895); Geikie, *Text Book of Geology* (London, 1903); Frech, "Die geographische Verbreitung und Entwicklung des Cambrium," *Compte Rend. Congrès Géologique Internationale*, 1897 (St. Petersburg, 1899); Chamberlin and Salisbury, *Geology*, vol. ii (New York, 1907). See GEOLOGY; POTSDAM SANDSTONE.

CAMBRIC, kām'brik. A general term applied to the finest and thinnest of plain woven linen fabrics. It is said to be derived from Cambrai (France), where such goods were first made. Some of the finest cambrics of the present day are produced in Switzerland. The term is also applied to cloth made of cotton with the fibre twisted very hard, to imitate real or linen cambric.

CAMBRIDGE, kām'brij (Cam bridge; Neo-Lat. *Cantabrigia*). The county town of Cambridgeshire, England, situated on the Cam, about 57 miles north-northeast of London (Map: England, G 4). It is at the head of river navigation and has since Roman days been on a natural line of communication. Remains of a Roman town have been discovered near by. The town, as a whole, is less picturesque than its rival, Oxford, and its main street, Trumpington, does not compare favorably with the famous High Street of Oxford. On the other hand, many of its college buildings are, from an architectural standpoint, the equal of any which its sister university possesses; and the beautiful lawns and gardens behind the colleges, traversed by

the Cam, familiarly known as "the Backs," equal in beauty the justly praised Christ Church Meadow of Oxford. Besides the colleges Cambridge possesses few interesting features. The church of the Holy Sepulchre is one of the four existing round churches in England. Cambridge is a parliamentary borough and sends one member to the House of Commons. The city has a large public library and makes large grants to a number of schools. The earliest-known date in Cambridge history is when, in 1068, William the Conqueror built a castle on Castle Hill. During the thirteenth century it became the centre of a number of religious orders, and about these grew up the fame of Cambridge as a seat of learning. In 1281 the Bishop of Ely founded Peterhouse, the first college in Cambridge. Pop., 1891, 37,000; 1901, 38,379; 1911, 40,027.

Cambridge, probably on the site of the *Cam-boritonum* of the Romans, takes its name from the river Cam, which was anciently, and is still in its upper reach, called the Granta. To the Saxons Cambridge appears to have been known as Grantabrydge. In 870 the Danes ravaged the country hereabouts and are said to have destroyed the town. The town received its first charter from Henry I in 1118. King John in 1200 granted a charter to the town, permitting it to have a guild of merchants and in 1207 confirmed the burgesses in their privileges in perpetuity. See CAMBRIDGE, UNIVERSITY OF.

Bibliography. Atkinson, *Cambridge described and Illustrated* (London, 1897); Stubbs, *Cambridge* (London, 1905); Maitland, *Cambridge Township and Borough* (Cambridge, 1898); Wood, "Cambridge in Early and Medieval Times," in *Builder*, vol. lxxxi (London, 1901); Gray, *The Dual Origin of the Town of Cambridge* (Cambridge, 1908); Clark, *Cambridge* (London, 1890).

CAM'BRIDGE. A village and the county seat of Henry Co., Ill., 30 miles southeast of Rock Island, on the Rock Island and Peoria Railroad (Map: Illinois, B 2). It is the centre of a fertile agricultural region, and exports live stock and grain. Pop., 1890, 940; 1900, 1345; 1910, 1272.

CAMBRIDGE. A city and the county seat of Dorchester Co., Md., 57 miles (direct) southeast of Baltimore, on the Choptank River, and on the Cambridge and Seaford Railroad (Map: Maryland, N 6). It is the centre of a rich agricultural district and has an extensive oyster-packing industry, and important manufactures of underwear and lumber. Settled in 1684, Cambridge was incorporated as a Colonial town early in the eighteenth century; the present city charter dates from 1900. Under its provisions, the mayor is elected every two years by the city council, which consists of the executive and four aldermen, chosen by wards. Pop., 1890, 4192; 1900, 5747; 1910, 6407.

CAMBRIDGE. A city, the seat of Harvard University, and one of the county seats of Middlesex Co., Mass. It is the fifth city in rank in the State according to population. It lies on the Charles River opposite Boston, of which it is practically a suburb, being connected by several bridges (Map: Massachusetts, E 3). It is entered by the Boston and Albany and the Boston and Maine railroads, and electric railroads connect with Boston and adjacent towns. The Cambridge Main Street Tunnel, built by the Boston Elevated Railroad Company, and the Cambridge

Connection in Boston, including a tunnel under Beacon Hill, built by the city of Boston and leased to the operating company at 4½ per cent upon the net cost (the line opened March 23, 1912), carry the trains of the operating company between Harvard Square and the Park Street station of the Boston subway and surface system. The historic divisions are still locally known as Old Cambridge, North Cambridge, East Cambridge, Cambridgeport, and Mount Auburn. The county courthouses are in East Cambridge. Cambridge is irregular in shape, generally level in surface, and covers an area of about 6½ square miles. Several of its streets and avenues are shaded with beautiful old trees, and there are many handsome residences and a few well-preserved Colonial mansions, among them the Vassal-Craigie House, occupied by General Washington at the time of the Revolution and later the home of the poet Longfellow, now fronted by a memorial park, and Elmwood, the birthplace and lifelong home of James Russell Lowell. The principal features of Cambridge are Harvard University (q.v.), with its ample grounds and many buildings, Radcliffe College (q.v.), the buildings of the Protestant Episcopal Divinity School, the Andover Theological Seminary (erected here in 1910), the First Parish Church (Unitarian), the Shepard Memorial Church (Congregational), commemorating Rev. Thomas Shepard (q.v.), and Christ Church (Protestant Episcopal), dating from 1761. The old city common, with a memorial gateway, contains a soldiers' monument and a statue of John Bridge the Puritan, by Thomas R. Gould and his son Marshall S. Gould, placed in 1882. Less than a mile from the university are the Harvard Observatory and the Botanic Garden of eight acres, filled with a great variety of trees, shrubs, and plants, especially of native species. Mount Auburn Cemetery, partly in Cambridge, one of the most beautiful places of burial in the country, contains the graves of Longfellow, Lowell, Holmes, Sumner, William Ellery Channing, Phillips Brooks, and many other distinguished men and women. Among prominent buildings, other than those already mentioned, must be noted the public library, Cambridge Hospital, the Latin School, High School, Rindge Manual Training School, the city hall, the courthouse, jail, and other county buildings. On the river front, with entrance from Massachusetts Avenue, the Massachusetts Institute of Technology is erecting (1914) a noble group of buildings to which it will remove from Boston when completed. Cambridge has a fine system of public parks; besides interior parks, the river parkways include the entire river front and add greatly to the beauty of the city.

Among the industrial establishments of Cambridge are the Riverside, Athenæum, and University presses, the latter dating from the earliest printing house in America, founded in 1639, which are all widely known. There are also large foundries and machine shops, meat-packing houses, extensive bakeries, and large manufactories of soap and candles, pianos and organs, furniture, confectionery, rubber goods, boilers, chemicals, astronomical instruments, electrical machinery, carriages, steam pumps, bricks, and many other articles. It ranks ninth among the manufacturing cities of the State (United States census, 1910). The industries are centred principally in Cambridgeport and East Cambridge.

Cambridge is governed, under the charter of 1891, by a mayor, elected annually, and a bicameral municipal council, of which the board of aldermen is elected at large and the common council by wards. In the administrative departments the majority of officials are appointed by the mayor, subject to the confirmation of the board of aldermen; the city council, however, elects the city clerk and assistant treasurer, auditor, messenger, clerk of committees, solicitor, and overseers of the poor; and members of the school board are chosen by popular election. Cambridge owns and operates its water works. A feature of the municipal politics deserving of mention is the fact that Cambridge is the largest city in the world with no open saloons, and the no-license system, as operated under the Massachusetts local-option law, seems well established.

History. Cambridge originally included the present towns of Lexington and Arlington, parts of Bedford and Billerica, Newton, and the Brighton district of Boston. It was settled as Newe Towne, in 1630, by Governor Winthrop and others, the chief founder being Thomas Dudley, who intended it to be the chief place of the Colony, but found the peninsula of Shawmut (Boston) better adapted for commerce and for defense against the Indians. Resettled in 1631, it received in 1633 its first pastor and teacher, Rev. Thomas Hooker (q.v.) and Rev. Samuel Stone, who removed with their congregation to Connecticut in 1636, largely owing to ecclesiastical differences. In 1637 the General Court ordered that the college it had previously decided to found be established at Newe Towne, and in 1638 that Newe Towne become Cambridge. In the same year the first class began its studies, and the name "Harvard College" was given to the modest institution. (See HARVARD, JOHN.) During the time Boston was held by the British army (1775-76) Cambridge was occupied by the American army, and Washington assumed command in 1775 under a large elm, which is still standing. The city charter of incorporation was granted in 1846. Cambridge claims to have enlisted the first company of volunteers for service on the Federal side at the outbreak of the Civil War, and during that conflict it furnished 4588 men to the Union army and navy. The city has been the home of many famous literary men, notably of Longfellow, Lowell, Holmes, Higginson, and Fiske.

Pop., 1790, 2115; 1830, 6072; 1850, 15,215; 1880, 52,669; 1890, 70,028; 1900, 91,886; 1910, 104,839; 1920, 109,694, including 34,608 persons of foreign birth and 4707 of negro descent.

Consult: Paige, *History of Cambridge* (Boston, 1877); *Two Hundred and Fiftieth Anniversary of the Settlement of Cambridge, December 28, 1880* (Cambridge, 1881); Hurd (ed.), *History of Middlesex County* (Philadelphia, 1890); Gilman (ed.), *The Cambridge of Eighteen Hundred and Ninety-six* (Cambridge, 1896); Powell, *Historic Towns of New England* (New York, 1898).

CAMBRIDGE. A village in Washington Co., N. Y., about 30 miles (direct) northeast of Albany, on the Delaware and Hudson Railroad (Map: New York, G 4). Cambridge is noted principally as the seat of the Cambridge Valley Agricultural and Stockbreeders' Association. It has a public library, and carries on a trade in seeds, plows, and dairy products. Pop., 1890, 1598; 1900, 1578; 1910, 1528.

CAMBRIDGE. A city and the county seat of Guernsey Co., Ohio, 85 miles east of Colum-

bus, on the Baltimore and Ohio and the Pennsylvania railroads (Map: Ohio, G 5). The surrounding region has deposits of fine pottery clay, natural gas, coal, and oil. Cambridge ships large quantities of coal and has sheet and tin plate mills, a large earthenware plant, division shops of the Pennsylvania Railroad, a bar mill, chair and glove factories, a glass plant, and planing mills. The city owns and operates its water works and has a public library. Settled in 1806, Cambridge was incorporated in 1837. It is governed by a charter of 1893 which provides for a mayor, elected biennially, and a city council. Pop., 1890, 4361; 1900, 8241; 1910, 11,327; 1920, 13,104.

CAMBRIDGE, ADA (1841-1926). The pseudonym of Mrs. George Frederick Cross, novelist, born at Wiggenshall, Norfolk, England, and after 1870 a resident of Victoria, Australia. She became widely known by *A Marked Man* (1891); *The Three Miss Kings* (1891); *A Little Mina* (1893); *Fidelis* (1895); *At Midnight* (1897); *Materfamilias* (1898); *Path and Goal* (1900); *The Devastators* (1901); *Thirty Years in Australia* (1903); *Sisters* (1904); *The Retrospect* (1912); *The Hand in the Dark* (1913). See AUSTRALIAN LITERATURE.

CAMBRIDGE, GEORGE WILLIAM FREDERICK CHARLES, second DUKE OF (1819-1904). An English soldier, son of Adolphus Frederick (1774-1850), the first Duke of Cambridge, who was a son of King George III. The second Duke was born in Hanover and succeeded in 1850. In 1837 he was colonel, and in 1854 as lieutenant general commanded the first division sent in aid of Turkey against Russia. He led the troops at the Alma and at Inkerman. In 1856 he became acting commander in chief of the British army. He was made field marshal and in 1887 received the patent of commander in chief. In 1895 he was retired. Many of the army reforms he personally opposed. In 1840 he marriedmorganatically Miss Louisa Fairbrother, an actress, who was thereafter known as Mrs. FitzGeorge; and their relation as husband and wife remained unbroken for 50 years, until Mrs. FitzGeorge's death in 1890. Consult Sheppard, *Memoir of Private Life of Duke of Cambridge* (London, 1906), and Verner, *Military Life* (ib., 1905).

CAMBRIDGE, UNIVERSITY OF. The younger of the two ancient seats of learning in England. The origin of the university, like that of Oxford, is obscure. The old Benedictine establishment in Cambridge was swept away by the Danish invasions, and the university cannot boast the continuous existence beyond the Conquest assigned to it by the older writers. Though we may disregard the various fables of its foundation by a Spanish King, Cantaber, by King Arthur, by a Saxon King, Sigebert, and by Gisbert and his three companion monks of Croylund, it seems very probable that the university originated in some local educational movement during the twelfth century, augmented, as time went on, by such influences as the migration of Oxford students thither in 1209 and of students from Paris in 1229. As early as 1231 a chancellor is mentioned in a royal writ and two years later the university received papal recognition. Following the example of Paris, Cambridge maintained, besides the trivium and quadrivium (q.v.), or faculty of arts, the advanced faculties of theology, civil and canon law, and medicine. It was, however, not recognized formally as a Studium Generale

until the papal bull of 1318. Like Paris, too, Cambridge was governed by a guild or corporation of masters, resident teachers called regents, with whom resident masters not engaged in teaching, called nonregents, were later associated. The presiding officer, called the chancellor, was elected by the regents. To this new university the mendicant orders came very early—the Franciscans about 1224, the Dominicans half a century later. These, as well as other bodies of monks and of friars, established houses for their members, and for a time played a considerable part in university affairs, but their permanent influence was, save perhaps in one direction, not great. In the earlier stages of the university the students, here as elsewhere, had boarded and lodged independently. With the increasing size and importance of Cambridge there now arose, alongside these religious houses, voluntary associations of students, living together in independent hostels or halls. Private benefactors, finding in these fit subjects for encouragement, presently began to endow these halls, or to establish "colleges," often by the consolidation of several halls. This new form of institution, providing for the support of deserving students, combined the idea of supervision and support of the religious houses with that of the independence of the halls. The collegiate system, beginning on the Continent, seems to have been carried to Cambridge by way of Oxford, and, though not original with either, has survived in them alone, giving them their unique place among the universities of the world. The first of the Cambridge colleges, Peterhouse, a purely academic organization with no monastic discipline, was founded in 1284 by Hugh of Balsham, Bishop of Ely, and from this time for almost exactly three centuries the foundation of colleges continued. With one exception, the Cambridge of to-day is formed of the colleges established during that period. In this, Cambridge differs much from Oxford, for though four colleges were founded in Oxford in the seventeenth and eighteenth centuries, the only permanent collegiate foundation in Cambridge since 1596 is Downing College, established in 1807. The short-lived Cavendish College (q.v.), Selwyn College (1882), a "hostel," and the foundations for women, Girton (1869) and Newnham (1875), are not formally connected with the university. (A list of colleges, with the dates of their foundation, will be found at the end of this article, and separate notices of the colleges under their names in the body of the *ENCYCLOPEDIA*.)

The university, thus constituted, played a great part in the Reformation. Humanism entered Cambridge early, associated with the names of Sir John Cheke, Sir Thomas Smith, and Bishop Fisher. Of those closely associated with the Reformation, Erasmus was Lady Margaret professor of divinity from 1511 to 1514 and translated the New Testament here. Here, too, William Tyndale and Hugh Latimer began their labors in the new cause, and from here came Cranmer, who, in more ways than one, shaped the English Reformation in later years. The Royal Injunctions of 1535 mark an epoch in the history of the university, for by them the new learning was finally established. The study of the canon law was discontinued, public lectures in Greek and Latin were established in the colleges, the Bible, studied in the light of the new learning, replaced the Sentences, and the human-

istic method took the place of the scholastic. As elsewhere, the recognition of the royal supremacy was enforced here, and with these sweeping changes, and the replacing of the clerical element in the university by lay students, the mediæval history of Cambridge may be said to close and its modern history to begin.

For the moment, however, here, as in all universities which took a leading part in the Reformation, the immediate effect of that movement was disastrous. It was not until the reign of Elizabeth that Cambridge began to recover from the shock. Then it became the stronghold of advanced Puritanism, as it had earlier been of advanced Protestantism, particularly under the influence of Cartwright, who was finally deprived of his official position in the university on this account. Largely owing to the disturbances arising from this, new statutes were enacted in 1570, which lasted till the middle of the nineteenth century. By these the government of the university was practically vested in the heads of the colleges, who alone elected the vice chancellor and the *Caput*, or supervising board. This turned Cambridge into a close corporation, a misfortune not bettered by the fact that with it went a tendency to turn the university into a school of divinity. The reign of James I is memorable as the period when the university was granted the privilege of returning two members to Parliament (1604), which it still enjoys. The later seventeenth century saw the rise of the school of Cambridge Platonists, and, chiefly by the influence of Isaac Newton and Isaac Barrow, the beginnings of that tendency toward the cultivation of mathematics and the natural sciences, which is still one of the chief distinctions between Cambridge and Oxford. During the eighteenth century, until the rise of the Evangelical school, the same mediocrity and apathy in religious matters prevailed here as elsewhere, but scholarship was improved by the evolution of the tripos into something like its present position, the mathematical tripos being introduced in 1747. The nineteenth century saw sweeping changes, the reorganization of colleges and university, greater freedom in academic matters, the abolition of religious tests, and a more liberal idea of the importance of certain studies as well as of the relations between certain lines of work. Between 1840 and 1850 several colleges secured new charters from the crown, and in the latter year a commission began a revision of the statutes, which led to the replacing of the Elizabethan statutes by those of the new commission in 1858. These were in turn altered in 1869 and 1871-72, and in the latter year another commission was appointed, on the strength of whose report (1874), and of a memorial issued by an influential body in the university, the Universities of Oxford and Cambridge Act was passed in 1877 and approved by the crown in 1882. This effected a reorganization of the entire university system. Meanwhile various internal changes had been taking place. To the older triposes of classics and mathematics, were added the natural sciences tripos in 1850, the moral sciences tripos in 1851, the law tripos in 1858, divided into law and history in 1872, the Semitic language tripos in 1878, the Indian language tripos in 1879, the mediæval and modern language tripos in 1886, and in 1905 the economics tripos. There are at present 11 triposes in all.

The university at present is a self-governing

corporation, administered by a senate, consisting of all doctors and masters, of whom only those in Cambridge have electoral rights. The council of the senate, consisting of the chancellor, the vice chancellor, four heads of colleges, four university professors, and eight associates from the senate, prepares agenda for the senate, chooses the vice chancellor, and in general carries on the ordinary administration of the university. The funds are managed by a financial board, the curriculum is arranged by a general board of studies, separate departments being in the hands of subcommittees, or special boards. The chancellor is an honorary official, as at Oxford, usually some dignitary of the realm, as are also the steward and the deputy steward. The vice chancellor is the real head of the university, and is assisted by deputies and by two proctors, who, besides their duties in the senate, have charge of university discipline. There are, moreover, two esquire bedells, the public orator, a commissary, an assessor, and the registrar, who has charge of records. There are at present 17 colleges besides the two foundations for women, several special semicollegiate institutions not a part of the university, and a body of non-collegiate students. The university proper, as distinguished from the colleges, is possessed of several important institutions. The Fitzwilliam Museum, founded by Viscount Fitzwilliam in 1816, is one of the largest and finest institutions of its kind in England. The university library contains some 200,000 volumes, and a considerable collection of manuscripts. There are also fine geological and anatomical museums, an excellent observatory, and the university practically controls the extensive printing and publishing establishment of the Pitt Press, as well as Addenbrooke Hospital. Examinations are held and degrees are conferred in the Senate House, which contains also the public offices of the university, and is the meeting place of the senate.

The existence of the colleges in connection with the university forms a peculiar, and, save for Oxford, a unique educational organization, not easy for an outsider to understand. Briefly, it may be said that the college and the university are separate corporations, in large measure independent of each other, but connected very closely by the fact that they form interacting parts of an educational system, and that they are composed of, and managed by, the same individuals. The university is essentially an examining and degree-conferring body, which examines the candidate at entrance, during his residence, and at the conclusion of his work, and confers degrees on those men who meet its requirements. It regulates the system of education, with respect not only to subjects, but also to quality, and quantity of preparation; it enforces general discipline, and it offers certain educational advantages in its lectures, its libraries, its collections, and similar provisions. The college, on the other hand, receives the entering student, provides him with lodgings and meals, service, and the like, prepares him, by its tutors, for the university examinations, affords him society and recreation, and exercises somewhat more than paternal oversight of his actions. The administration of the colleges is in the hands of a master and fellows, from among whom are chosen the college officials, dean, bursar, and the like, as well as the teaching or tutorial force of the college. These men, as masters of arts

of the university, form a great part of the senate, and so virtually govern it as well as the colleges.

Undergraduate life at Cambridge differs somewhat from that at Oxford and very greatly from that in the United States. Formerly, all men belonged to colleges, and though since 1869 it has been possible for men to belong to the university without being members of a college, the class of noncollegiate students thus created has never been very large, most undergraduates being connected with a college. The great majority of men live in college, though many of those belonging to colleges, and all the noncollegiate students, live in licensed lodgings in the town. There are three terms in the university year—the Michaelmas, or October term; the Lent, or winter term; and the Easter, or spring term. These nominally include 227 days, but actually average each about eight weeks of required residence, leaving long vacations, during which much of the actual work, or “reading” as it is called, is done. The students are under the direct charge of the tutors, who maintain personal relations with each man under their charge and supervise his work, directing him in a way not known to the educational system in the United States with its large classes and entire or partial absence of personal relation between student and instructor.

The degree of B.A. may be conferred, after the required examinations have been passed, at the end of nine terms or three years of residence. The degree of M.A. is attainable three years later, the requirements being that a candidate give notice to his college, pay the college degree fee in person, pay the university degree fee in person, and sign the Registrar's Book. The university confers also degrees in law, theology, medicine, music, and an advanced degree in science, all of these latter being dependent on the possession of the bachelor's degree. Certain honorary degrees are also conferred, notably that of Doctor of Laws (LL.D.).

There are no exact equivalents at either of the English universities for the course of study common in the United States. The system of education is based upon, and conditioned by, the examinations which a candidate for the degree of B.A. must take. These are three in number. The following, from the 1900-01 regulations, will give the best general idea of the system. The “previous” examination consists of two parts, one of the Gospels (Greek), one Latin classic, one Greek classic, one translation of English into Latin, and a paper on Latin and Greek accidence and syntax, forming the first part. The second consists of Paley's *Evidences*, geometry, arithmetic, elementary algebra, and an English essay. Candidates for honors must take the additional subjects of mechanics, French, and German. After passing these requirements or some equivalent a student may at the proper time take the second or “general” examination and the special, which qualify him for the “ordinary” degree, or he may specialize in any of the subjects to be mentioned and after passing the final examination or tripos be entitled to an “honors” degree. The distinction between ordinary and honors degrees is not found in American colleges. The second or “general” examination consists of two parts, the first including one Greek classic, one Latin classic, algebra, elementary statics, a translation of English into Latin prose; the second, the *Acts of the Apostles* (Greek), some portion of English history, an

English essay on a subject connected with the history offered, elementary hydrostatics, and some play of Shakespeare or a portion of Milton's works. The special or final examination may be taken in any one of the following subjects: theology, logic, political economy, law, history, chemistry, physics, geology, botany, zoology, physiology, mechanics, and applied science, music, modern languages, mathematics, or classics. For those men who are candidates for honors, special examinations, called triposes, are provided in mathematics, classics, moral sciences, natural sciences, law, history, theology, Oriental languages, mediæval and modern languages, mechanical sciences, and economics. The successful candidates in the triposes are arranged in three classes, according to their standing, and have their names printed in the Calendar. These divisions are called simply first, second, and third class. The honor men in mathematics, however, were formerly known as wranglers, senior optimes, and junior optimes, and the head of the first list, the best man of the year, is known as the senior wrangler. Since 1908, however, the results of Part I of the mathematical tripos are published in the same form as of the other triposes; the results of Part II are still arranged in three classes of wranglers, senior optimes, and junior optimes, but in alphabetical order.

Women are admitted to the examinations, and their names appear in the Calendar, next to the tripos lists, with their rank attached, but they are not allowed degrees.

For further information consult: *College Histories* (Cambridge, 1898-1904); *Oxford and Cambridge Year Book, Part 2, Cambridge* (London, 1904); *The Student's Handbook to the University and Colleges of Cambridge* (Cambridge, 1909); *History of the University of Cambridge*, by J. Bass Mullinger, in 3 vols. (Cambridge, 1873-1911), the best as well as the fullest account up to the Platonist movement. There is an excellent, though briefer, account of the university and colleges before 1500 in H. Rashdall, *Universities of Europe in the Middle Ages* (Oxford, 1895). Official information may be obtained from the Cambridge University Calendar, and from the announcements of lectures and such publications as are issued from time to time. Much incidental information may be obtained from Sir G. M. Humphrey's *Guide to Cambridge* and J. W. Clark's *Concise Guide to the Town and University of Cambridge* (Cambridge, 1906).

See the articles in the present work on UNIVERSITY; EDUCATION; NATIONAL EDUCATION, and on the various colleges under their names.

The colleges in the order of their foundation, with dates and founders, are as follows:

Peterhouse, or St. Peter's College, 1284, by Hugh of Balsham. Clare, 1326, by Elizabeth, Countess of Clare. Pembroke, 1347, by Mary de St. Paul, Countess of Pembroke. Gonville and Caius, 1348, by Edmund Gonville; refounded by William Bateman, 1353, and later by John Caius, 1558. Trinity Hall, 1350, by William Bateman, Bishop of Norwich. Corpus Christi, 1352, by Guilds of Corpus Christi and Virgin Mary. King's, 1441, by Henry VI. Queens', 1448, by Margaret of Anjou; refounded, 1465, by Elizabeth Woodville. St. Catharine's, 1473, by Robert Wodelarke. Jesus, 1496, by John Alcock, Bishop of Ely. Christ's, 1505, by Margaret of Richmond and Derby. St. John the Evangelist,

1511, by Margaret of Richmond and Derby. Magdalen, 1519, by Thomas, Baron Audley of Walden. Trinity, 1546, by Henry VIII. Emmanuel, 1584, by Sir Walter Mildmay. Sidney Sussex, 1594, by Lady Frances Sidney, Countess Dowager of Sussex. Downing, 1800, by Sir George Downing.

Public Hostels.—Cavendish College (q.v.), extinct, 1873-91. Selwyn College, 1882, by subscription. Ayerst Hall, extinct, 1884-96.

CAMBRIDGE PLATFORM. See CONGREGATIONALISM.

CAMBRIDGE PLATONISTS. A school of writers in the English church, members of the University of Cambridge, in the latter part of the seventeenth century, who sought to exhibit the entire rationality of the doctrines of the Christian religion and drew largely from Plato in execution of this purpose. They were the liberals of their age and were often styled "Latitudinarians." They sought to emphasize the great Christian doctrines to the neglect of minor matters, often made the instruments of sectarian exclusiveness, and to show that these great doctrines were identical with the teachings of the soundest philosophy. With a single exception (More, educated at Emmanuel College and of the Puritan party) they worked in great harmony; while they naturally belonged to the party that had formulated the Puritan theology in the Westminster Confession, they were led, by the prevailing laxity of morals and the multiplication of sects, to endeavor to overcome the schism between divinity and morals. They were powerfully influenced by the philosophical currents of their time, particularly by the writings of Descartes (Cudworth and More), less so by those of Bacon. But as a school, they were formed by the study of Plato especially in its Neoplatonic form, and of the Christian Fathers who followed the Platonic course of thought—those of Alexandria. On the other hand, the school was largely determined by its fundamental antagonism to the doctrines of Hobbes, who founded his philosophy on the senses and ignored the moral and religious postulates of human nature. Against this philosophy the Cambridge Platonists waged uncompromising and unceasing war. Their liberalism, however, brought them into suspicion, and they were generally regarded with disfavor. They possessed great learning and a strong religious sense, but did not deal with their sources in a trained historic spirit.

The principal representatives of this school were the following:

Benjamin Whichcote, born in Shropshire, March 11, 1609-10, died at Easter, 1683, in Cambridge. His father was apparently a country squire, the owner of Whichcote Hall. He was sent to Emmanuel College in 1626, took his B.A. in 1629 and his M.A. in 1633, when he became fellow of his college. In 1636 he was ordained, in 1643 presented to the living of North Cadbury, where he probably married. He was made provost of King's College, Cambridge, in 1644, and continued to occupy this post till the Restoration, 1660, when he was displaced by the royal order. His great work here was performed as a teacher, and particularly as the preacher of the Sunday afternoon lecture in Trinity Church. In these sermons he sought to lift the plane of current religious thinking, and he exercised the great influence which belongs to those whom the sight of a receptive audience quickens to elo-

quence. After his removal he occupied two different charges in London, spending his last 15 years in St. Laurence Jewry, where he was attentively heard by a small but select congregation. He published nothing himself. After his death a few sheets of *Select Notions* were published in 1685, a *Treatise of Devotion* in 1697, then *Select Sermons* (1698) with a preface by the Earl of Shaftesbury (reprinted, Edinburgh, 1742); and in the years 1700 ff. a new edition of the sermons from the author's own manuscripts in 4 vols., with a volume of *Aphorisms* (1753).

John Smith, one of the most gifted of the school, born at Achurch, Northamptonshire, 1618, died Aug. 7, 1652, has left behind almost no materials for a biography. He entered Emmanuel College, Cambridge, in 1636, took his B.A. in 1640 and his M.A. in 1644, at which time he was chosen fellow of Queens' College. His health seems to have been precarious from the first. His labors were principally confined to his office as teacher, for which he had remarkable qualifications. His preaching was with a rare degree of eloquence, which can still be felt in the *Discourses* (1660), which remain to us. He gained much local fame as a lecturer on mathematics. His personal character was such as to excite the admiration and love of his associates in a remarkable degree. As a founder of the school, his special service was in developing the foundations of a Christian philosophy.

The two most famous of the Cambridge Platonists are *Ralph Cudworth* and *Henry More*, whose lives will be found in their alphabetical places in this ENCYCLOPÆDIA. More obscure were *Nathaniel Culverwel*, of a genius and eloquence like Smith's, who entered Emmanuel in 1633 and took his M.A. in 1640, was a fellow and preacher in the College Chapel, died about 1651, and whose *Discourse of the Light of Nature* was published 1652; *John Worthington*, a native of Manchester, educated at Emmanuel College, master of Jesus College till the Restoration, then held a succession of livings, and finally Hackney, where he was chosen lecturer in 1670, his *Discourses* being published in 1725 and *Miscellanies* in 1704; *George Rust*, fellow of Christ's College in 1657, after the Restoration in Ireland, where, in 1667, he became Bishop of Dromore, died in 1670, his *Discourse of Truth* appearing in 1682; *Simon Patrick* (1626-1707), Bishop of Chichester, 1689, and of Ely, 1691; *Edward Fowler*, took his M.A. in Trinity College, Cambridge, about 1655, finally Bishop of Gloucester; *Joseph Glanvill* and *John Norris*, both Oxford students, but impregnated with the spirit of the Cambridge Platonism. Consult *John Tulloch*, *Rational Theology and Christian Philosophy in England in the Seventeenth Century*, vol. ii (Edinburgh, 1872). Consult for selections from their writings, Campagnac, *Cambridge Platonists* (Oxford, 1901).

CAMBRIDGESHIRE. An inland agricultural county of England (Map: England, G 4). Area, 858.9 square miles. Nearly nine-tenths of the county consists of arable land, meadow, and pasture, the rest being fens. The chief rivers are the Ouse, which crosses the middle of the county from west to east, with its tributary the Cam, the Nene, which borders the county on the north, and the Lark. These are all navigable to a certain extent. County town, Cambridge. Pop., 1891, 183,961; 1901, 184,759; 1911,

198,074. Consult Conybeare, *History of Cambridgeshire* (London, 1897).

CAMBRONNE, kām'brūn', PIERRE JACQUES ETIENNE, COUNT OF (1770-1842). A brave and blunt soldier of Napoleon, most widely known, perhaps, for a phrase he never uttered. He was born at Saint-Sébastien, near Nantes, fought in the Vendée in 1792, distinguished himself at Zurich in 1799, and participated in the campaigns of the Empire between 1806 and 1813. He went with Napoleon to Elba, and at Waterloo led a division of the Old Guard. There, after fighting like a madman, he is reported to have cried in answer to General Halkett's demand for his surrender, *La garde meurt et ne se rend pas* ('The Guard dies, but never surrenders'). Cambronne did not say this, however, and he did surrender. Severely wounded, he was taken to London, but bravely returned to stand his trial before a court-martial, which acquitted him. In 1820 he was restored to his rank in the army. A statue has been erected in his memory in the town of Nantes, where he died in 1842. Consult Fournier, *Procès du général Cambronne* (Paris, 1816).

CAMBUSCAN'. The King of Tartary in Chaucer's *Squire's Tale*. The King of Arabia and India sends him a brazen horse, a mirror, a ring, and a sword of magic properties. He is the father of two sons, Algarsif and Camballo, and of a daughter, Canace. The story stops after a sort of prologue which promises adventures to come, more especially for Camballo and Canace; so the later history of Cambuscan and his presents is unknown.

CAMBYSES, kām-by'sēz, I (Gk. Καμβύσις, OPers. inser. *Kambūjiya*, of uncertain etymology). The father of Cyrus the Great and son and successor of Teispes in the line of Persian kings (Herod. vii, 11, and the Cyrus Cylinder).

CAMBYSES II (?-522 B.C.). King of the united realm of the Medes and Persians from 529 to 522 B.C. He was the grandson of Cambyzes I and son of Cyrus the Great. Ascending the throne on the death of his father, he at once took the reins of government in his hands. His brother, Smerdis (OPers. *Bardiya*), was made Viceroy of the eastern provinces of Iran. Cambyzes' first and chief design was the conquest of Egypt. He invaded this country with his armies, and in 525 B.C. defeated Psammetichus III, the King of Egypt, at Pelusium. Memphis, the capital, fell in the following year, 524 B.C., and Cambyzes was soon master of the entire fertile valley of the Nile. Nubia was also subjugated, but not without great loss to his forces, and an attempt to conquer the Ethiopians proved a disastrous failure. An expedition likewise against Carthage had to be abandoned because his Phœnician allies refused to lend their naval power against their kindred. It was now that Cambyzes received news that the throne of Persia had been seized, during his absence, by a Magian priest Gaumata, the Pseudo-Smerdis. The usurper impersonated Bardiya, or Smerdis, Cambyzes' brother, who had been assassinated, though the people did not know it, at the instigation of Cambyzes himself. Startled by this bold impersonation of one whom he believed to be dead, the guilty and crime-laden Cambyzes hastened to retrace his steps to Persia, but died on the way (522 B.C.), at Ecbatana, which Herodotus (iii, 62-64) calls a city of Syria, but Josephus names Damascus. The oracle of Buto had prophesied he would die

at Agbatana, but Cambyses always supposed the Median Ecabatana to be meant by this. In certain respects the accounts of Herodotus (iii. 64) and Ctesias differ as to the manner of his death, but both attribute it to an accidental self-inflicted wound. In the great Behistun inscription (i. 43) Darius says that Cambyses died by a death self-inflicted, but the word *uvā-maršiyuš*, lit. 'self-death,' seems rather, though not necessarily, to imply suicide. Regarding the character of Cambyses, if we follow Herodotus, his behavior in Egypt was little short of that of a madman. His cruelties and sacrilegious acts, due principally to drunkenness, were atrocious. He is said to have violated the tombs of the Egyptians and even to have put some of their leading men to death, among them the captive King Psammetichus. In an outrageous manner he stabbed the sacred bull of Apis so that it died, and he caused the ministering priests to be scourged (Herod. iii. 29). But it must be added that this account is not easy to reconcile with an existing stele on which Cambyses is portrayed as giving an honorable burial to the dead god Apis. It is even claimed that he murdered his own sister, whom he had wished to marry. On the whole there can be no doubt that he was a dissolute and inhuman ruler. Consult Lincke, "Kambyses in der Sage, Litteratur und Kunst des Mittelalters" (Leipzig, 1897), in the Ebers *Festschrift*; and see also CYRUS; DARIUS; MEDIA; PERSIA.

CAMBYSES, KING OF PERSIA. A tragedy by Thomas Preston, published in London in 1569 by John Alde. An undated edition was later brought out by Edward Alde. It has been reprinted by Hawkins and Dodsley. It is important as marking the transition between the morality and the historical drama. It is written in Alexandrine rhymes, occasionally dropping into heroics in the comedy passages. The melodramatic treatment of its subject is probably referred to by Shakespeare in his now proverbial expression of "speaking in King Cambyses' vein."

CAM'DEN. A town and the county seat of Wilcox Co., Ala., 62 miles west by south of Montgomery, on the Louisville and Nashville Railroad (Map: Alabama, B 3). It is the fertile "Black Belt" of Alabama and has a cotton-oil mill and lumber, cotton, and stock-raising interests. Pop., 1890, 545; 1910, 648.

CAMDEN. A city and the county seat of Ouachita Co., Ark., 115 miles south by west of Little Rock, on the Ouachita River, and on the St. Louis Southwestern and the St. Louis, Iron Mountain, the Rock Island, and Southern railroads (Map: Arkansas, C 4). It has a fine courthouse and public library and carries on a considerable river trade, shipping cotton, lumber, poultry, and live stock, and contains machine shops, cotton compress, stone mills, cottonseed-oil mill, lumber mills, manufactories of oars, sashes and doors, handles, and spokes, a bottling plant, and wagon works. Pop., 1900, 2840; 1910, 3995.

CAMDEN. A town in Knox Co., Me., 37 miles east by south of Augusta, on the line of the Eastern Steamship Company (Map: Maine, C 4). It is an important wool-manufacturing town and carries on a considerable trade in felt goods. Camden is also a summer resort. Pop., 1890, 4621; 1900, 2825; 1910, 3015.

CAMDEN. A city and the county seat of Camden Co., N. J., on the Delaware River, opposite Philadelphia, with which it is connected

by several lines of steam ferries (Map: New Jersey, B 4). It is an important railroad centre, being the terminus of the Atlantic City and the West Jersey and Seashore railroads and of divisions of the Pennsylvania Railroad. The city, which occupies an area of about 10 square miles on level ground, contains, among its more notable features, a city hall and county buildings, four hospitals, an Elks Home, Carnegie libraries, Home for Friendless Children, the West Jersey Orphanage, and a school for manual training. Camden is an important shipping centre, has large market gardens in the suburban districts, and is noted for its manufacturing and shipbuilding interests, which in 1909 gave employment to 3682 persons, and whose products were valued at \$5,626,000. The other leading manufactures are talking machines, canned soups, machinery, foundry products, cotton and woolen goods, oil cloth, lumber, chemicals, paints, steel pens, candies, and boots and shoes. In 1909 the combined value of all the manufactured products was \$49,138,000. The government is vested in a mayor and a unicameral city council, with the usual staff of administrative officials. The annual income of Camden is \$2,752,900, while its payments amount to \$3,033,300, the main items of expenditure being \$481,000 for education, \$139,000 for the fire department, \$158,000 for the police department, and \$160,000 for water works. The sewerage system comprises about 140 miles of mains, and the water works, including two plants built by the city in 1870 and 1889, at a total cost of \$2,500,000, are under municipal operation. Pop., 1890, 58,313; 1900, 75,935; 1910, 94,538; 1914 (est.), 105,000; 1920, 116,309. Camden was chartered as a city in 1828; the Camden and Amboy Railroad, incorporated in 1833, gave the city its early importance as a railroad terminus. It was the home of Walt Whitman from 1873 until his death in 1892. Consult Fidler, *A Local History of Camden* (Camden, 1858).

CAMDEN. A town and the county seat of Kershaw Co., S. C., 32 miles northeast of Columbia, on the Wateree River, and on the Seaboard Air Line, the Southern, and the Atlantic Coast Line systems (Map: South Carolina, D 2). It is known as a winter resort, carries on a trade in cotton, rice, and naval stores, and manufactures cotton cloths and yarns, cottonseed oil, lumber products, and bricks. Camden was settled in 1750 by Quakers from Ireland and in 1791 was incorporated as a town. It is governed under a charter of 1890, which provides for a mayor, elected every two years, and a municipal council. Here, on Aug. 16, 1780, an English force of 2000 under Lord Cornwallis defeated an American force of 3000 under General Gates, Baron DeKalb being wounded mortally in the engagement; and near here, at Hobkirk's Hill (see HOBKIRK'S HILL, BATTLE OF), an English force under General Rawdon repulsed an American force under General Green on April 25, 1781. In 1825 a monument was erected to the memory of DeKalb, Lafayette laying the corner stone. On Feb. 25, 1865, General Sherman entered Camden and destroyed 2000 bales of cotton, a large quantity of tobacco, and a number of buildings. Pop., 1900, 2441; 1910, 3569, including Kirkwood, which was annexed in 1905.

CAMDEN, CHARLES PRATT, first EARL (1714-94). An English chief justice and lord chancellor, third son of Sir John Pratt, a chief

justice under George I. He was born at Kensington and educated at Eton and Cambridge. In 1734 he became a fellow of his college, the next year obtained his B.A. degree and in 1740 that of M.A. He studied law and was admitted to the bar in 1738. His prospects were discouraging until 1752, when he successfully defended a bookseller for libel on the House of Commons. In 1757 he was appointed Attorney-General, and in 1762 Chief Justice of the Common Pleas. He presided over the trial of Wilkes and declared the action of government illegal, an opinion which, according with public sentiment, made him the most popular of judges. In 1765 he was created Baron Camden by the Rockingham administration, whose American policy and treatment of Wilkes, notwithstanding, he constantly opposed. The following year, although appointed Lord Chancellor, he did not abandon his principles; and four years after supported an amendment made by Chatham on the government address and resigned his office. Henceforth he was a political character. He took an active part against the ill-advised American policy pursued by Lord North, and in discussions on the law of libel was called "the maintainer of English constitutional liberty." During the Revolutionary War he was very popular in the United States, and his memory is perpetuated by many counties, towns, and villages named after him. He was President of the Council under Rockingham in 1782-83 and under Pitt from 1783 until his death, April 18, 1794. He was created Earl Camden and Viscount Bayham in 1786.

CAMDEN, WILLIAM (1551-1623). An antiquarian and historian, surnamed "The British Pausanias." He was born in London, where his father was a house painter, May 2, 1551. His education begun at Christ's Hospital, was completed at St. Paul's School and at Oxford. In 1575 he was appointed second master of Westminster School, and while discharging the duties of this office he undertook the work which made his name famous. His *Britannia*, written in elegant Latin and giving an account of the British Isles from the earliest ages, was first published in 1586, and it at once brought him into communication with the learned men of his time. Before 1607 the work had passed through six editions, being enlarged and improved by the industry of the author. At first a comparatively small volume, it received much additional matter from other writers. The best-known edition is that of Edmund Gibson, in English, 2 vols., folio (1722). The latest translation is that of Gough and Nichols (2d ed., 1806). Bishop Nicholson said of this work that it was "the common sun whereat our modern writers have all lighted their little torches." In 1593 Camden was appointed head master of Westminster School; and in 1597 Clarenceux King-at-Arms, an appointment which gave him more time for the pursuit of his favorite studies. His other important works are: *Annals of the Reign of Elizabeth* (latest ed., 1717); *A Collection of Ancient English Historians* (6th ed., 1607); *An Account of the Monuments and Inscriptions in Westminster Abbey* (1600); and *a Narrative of the Gunpowder Plot* (1607). He died Nov. 9, 1623, at Chislehurst, in the house which afterward belonged to Napoleon III, and was buried in Westminster Abbey. Before his death he endowed a professorship of history at Oxford.

CAMDEN SOCIETY. An English association. Vol. IV.—25

tion organized in London in 1838 and named in honor of William Camden. Its object is the publication of historical and literary remains of antiquarian and general interest. The publications began in 1847. After 105 volumes had been issued, a new series began (in 1871) which up to 1901 includes an additional 62 volumes. In 1901 began a new (3d) series in which 23 volumes have been published up to 1913.

CAMEL (OF., Lat. *camelus*, Gk. κάμηλος, *kamēlos*, from Heb. *gāmāl*, camel). A large desert-dwelling ruminant of two species, constituting the typical genus, *Camelus*, of the family Camelidæ. Both have been subjugated to man since prehistoric times, and neither is known or remembered in a wild state. The free camels which now roam in northern Turkestan, where they are hunted for their flesh, hides, and superior wool, are descendants of the few which survived the vast sand storms which, about 1700, overwhelmed the villages on the Gobi Plateau and killed all the people. The two species of camel are the true or Arabian camel (*Camelus dromedarius*), having one hump, and the Bactrian camel (*Camelus bactrianus*), with two humps. These humps are stores of flesh and fat, reabsorbed in support of the animal when overtaken by famine, as is so likely to happen.

The former is the common and widespread species, found from northwestern India and the lowlands of Afghanistan down to the extremity of Arabia east of the Red Sea and Somaliland to the south, and westward as far as the African deserts extend. They have also been introduced into Australia, Spain, Zanzibar, and the southwestern United States, but without permanent economic success. The United States government spent much money and pains to acclimatize them as an army transport service in the dry southwestern regions, about 1857; the Civil War interrupted the arrangements, but the attempts made by private hands to utilize the animals were not profitable. Many were turned loose and remained wild along the Mexican border, but multiplied very little, and they are now supposed to be extinct. The British government has made extensive use of them in its military operations in India and Upper Egypt, both as baggage animals and in hauling artillery, and as mounts for a division of "cavalry" known as the "camel corps." Consult Gleichen, *With the Camel Corps up the Nile* (London, 1888), wherein many interesting facts as to the habits and qualifications of the animal are given.

What country was the original home of this species is uncertain; it seems more thoroughly adapted to a sandy region than the Bactrian, and is presumed to have had a more southerly habitat than the latter, probably inhabiting Arabia and perhaps the Sahara when first enslaved by primitive men. It is singularly adapted to subsistence in the desert by the structural qualities elsewhere mentioned (see CAMELIDÆ), and by its ability to bite off and consume the tough shrubbery and even thorny plants which alone grow there, and to endure the burning heat and flying sand. To this end it has acquired not only the thick and broad sole pads, but the thick callosities on the joints of the legs and on the chest upon which it rests (in a kneeling posture) when it lies down; moreover, the nostrils may be closed against the flying dust, and the eyes are shaded and shielded by very long eyelashes. Its extremely acute sense of smell, especially for

water, is another life-saving provision. All these qualities have combined to render it so highly serviceable to man in the great wastes that separate the habitable regions south and east of the Mediterranean, Black, and Caspian seas, that it is safe to say these could never have been colonized and have been the scenes of the momentous incidents and impulses they have contributed to civilization had it not been for the assistance of this ungainly and unlovely creature. "I can speak from experience," remarks Captain Wellby (*Twist Sirdar and Menelik*, New York, 1901), "of this marvelous endurance of camels, for on a previous trip in Somaliland I once marched with a string of camels for 11 days, during which time none of them had a drop [of water]."

The Bactrian camel is better adapted by its smaller size and heavier build, harder and more cloven feet, longer and finer wool, and other qualities, to a rocky and cooler region, and its home is Central Asia, from northern Turkestan to Mongolia. Its endurance is equally remarkable, under different circumstances, with that of its southern congener, for it withstands the awful climate of the Tibetan Plateau, where the temperature rises to 140° F. in summer and sinks to Arctic cold in winter; it tramps with burdens of tea or hauling wagons or sledges over the plains, and often through wintry snows, from Peking to Lake Baikal, and carries heavy loads over the lofty passes of the Hindu Kush, and across the flinty plains of Afghanistan, and thence to Persia. It is this ability to endure climatic extremes, variety of fare, and famine, which has perpetuated the camel through a longer generic history than that of almost any other animal and has made it of so much service to mankind in regions unendurable by most cattle or horses.

The Arabian camel carries twice the load of a mule. The Bactrian camel is sometimes loaded with 1000 or even 1500 pounds weight, although not generally with so much. A caravan sometimes contains 1000, sometimes even 4000 or 5000 camels. The supply of food carried with the caravan for the use of the camels is very scanty; a few beans, dates, carob pods, or the like, are all that they receive after a long day's march, when there is no herbage on which they may browse. The pace of the loaded camel is steady and uniform, but slow—about 2½ miles per hour. Some of the slight dromedaries, however, can carry a rider more than 100 miles in a day. The motion of the camel is peculiar, jolting the rider in a manner extremely disagreeable to those who are unaccustomed to it; both the feet on the same side being successively raised, so that one side is thrown forward and then the other.

The patience of the camel has been celebrated by some authors, but this is mainly indifference and stupidity. It submits because it knows no better, cares nothing for its master, is influenced to a very slight degree by either kindness or harshness, is unhappy when alone, and always untrustworthy; is cowardly, and, at the rutting season, is subject to sudden and violent fits of rage, when it uses its teeth with terrible effect.

The camel produces only one young one at a time, or rarely two. It lives 30 or 40 years. During the long ages it has been subjected (the word "domesticated" hardly applies) to man, almost as many breeds have been created as in the case of the rose, and there is a vast difference between those bred as baggage animals and those reared for the saddle; the latter, light

and swift, often capable of traversing 100 miles of desert a day, are "dromedaries," whether one-humped or two-humped.

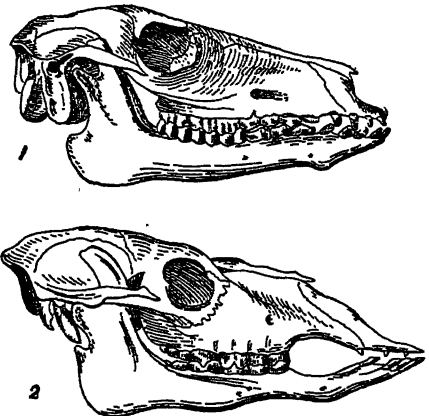
The great value of the camel to the desert people is due to its manifold usefulness, for besides its utility as a carrier of both man and his burden, and as a means of trade, its flesh is good food, and the milk is excellent; from the hair, cloth, ropes, etc., are made; the hide is serviceable; the bones (in eastern Asia) serve as ivory; and the dung is in some regions almost the sole dependence of the nomads for fuel. The animal is nevertheless steadily decreasing in importance by the advance of railways, the opening of wagon roads, and other supersessions of its service, even in the remoter parts of its arid domain. Consult Leonard, *The Camel* (London, 1894). See Plate of CAMELS and LLAMAS.

CAMEL (from *camel*, as carrying heavy burdens). A water-tight, boxlike contrivance designed for lifting ships, sunken weights, etc. The use of wooden floats for lightening the draft of a ship to permit her to pass over a shoal or bar is very old, but the invention of hollow floats, or camels, is ascribed to the Dutch, and their first use is said to have been about 1688. The ordinary camel is a simple rectangular box float, and is much used in navy yards and private shipbuilding establishments. The camels designed by the Dutch were sometimes a hundred feet or more in length, 20 feet broad, and made to fit the sides of the ship; they were allowed to fill with water, hauled up close to the vessel's sides, and secured in place by chains and lashings. When the ship reached the shoal or bar, the water was pumped out of the camels, and the increased buoyancy thus obtained raised the ship enough to materially decrease her draft. Modern camels which are used in wreck raising are generally built of steel and fitted with machinery for working the chains which support the wreck or attach it to the camel.

CAMEL BIRD. The ostrich; a book name.

CAMEL CRICKET, or **CAMEL LOCUST.** A mantis (q.v.).

CAMELIDÆ (Neo-Lat., from Gk. *κάμηλος*, *kamēlos*, camel). The camel family, constituting a section of the ruminants termed Tylopoda, in

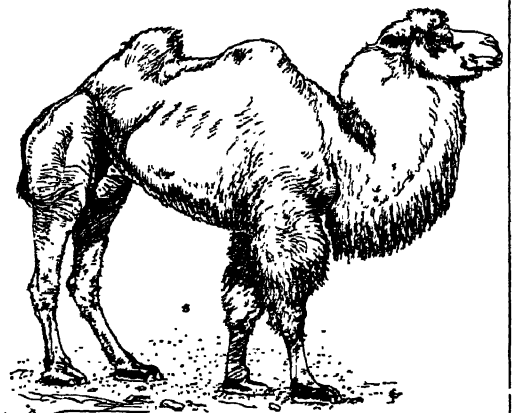
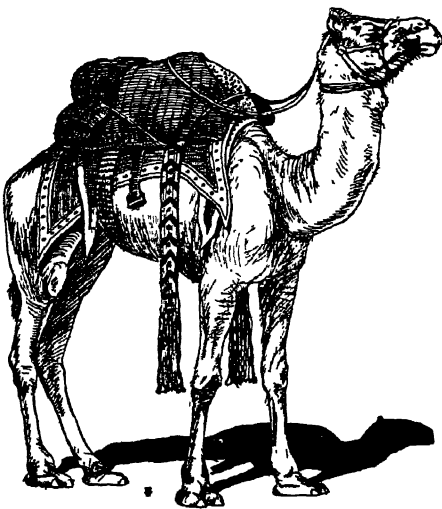
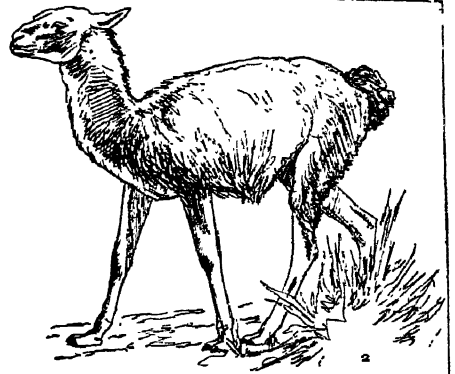


SKULLS OF CAMELS.

1, *Poebrotherium*, an extinct primitive type; 2, Existing camel, showing change in dentition.

reference to the character of the feet. This family is composed of two genera—*Camelus*, with two species (see CAMEL), and *Llama*, the Amer-

CAMELS AND LLAMAS



1. VICUNA (*Lama vicugna*).
2. GUANACO (*Lama guanacus*).
3. ALPACA.

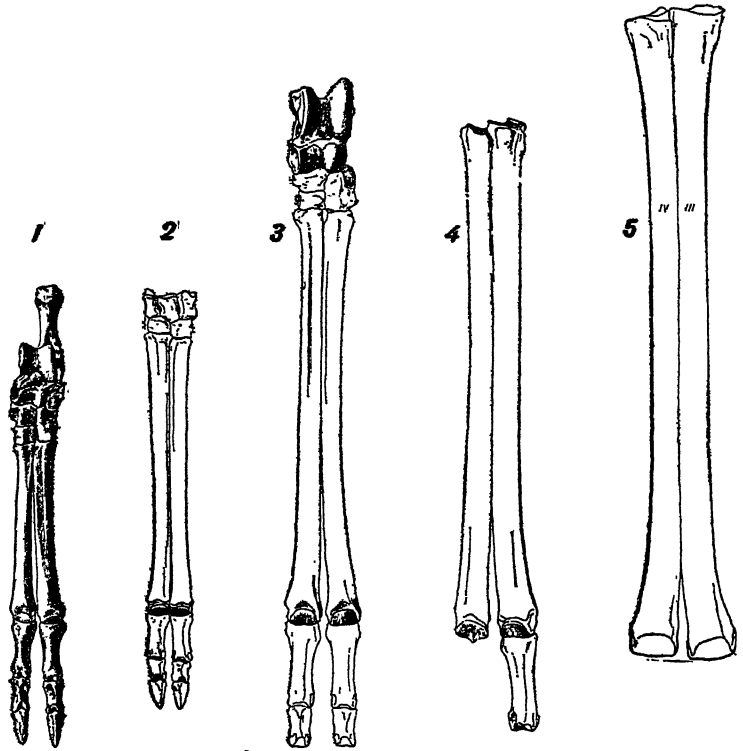
4. LLAMA.
5. ARABIAN CAMEL, Dromedary type.
6. BACTRIAN or TWO-HUMPED CAMEL.

ican llamas, considered by some naturalists two species, by others four. (See LLAMA.) These animals agree in peculiarities of structure, which separate them from other ruminants, mainly as follows: Though a full set of incisor teeth are present in the young, only the outermost continue through life as isolated lanianiform teeth; canines are present in both jaws, and the molars are solenodont in type. The skeleton has many peculiarities, of which a striking one is the excessive comparative length of the thigh bone, and the detachment of the hind leg from the body. The limbs are long, the ankle bones peculiar, and all traces of phalanges are lost, except the third and fourth. These are not incased in matched hoofs, like other artiodactyls, but the foot consists of two elongated toes, each tipped with a small, naillike hoof, the feet resting not upon the hoofs, but upon elastic pads or cushions under the toes. In the camels the toes are united by a common sole, thus resting upon one extended pad, instead of having each a separate one, as in the llama group, the broader expanse of the foot enabling the animals of the one genus more easily to traverse the loose sand of the desert, while the narrow form and separation of the toes in the other

is suited to the uneven surface of rocky heights. The head is long, without any horns or antlers, the lips extended and mobile, the neck of unusual length; the blood corpuscles are oval instead of circular, as in all other mammals, and the digestive organs are characterized by a remarkable peculiarity in the structure of the stomach. "Though these animals ruminate," to quote Flower and Lydekker, "the . . . interior of the rumen or paunch [see RUMINANT] has no villi on its surface, and there is no distinct psalterium or manyplies. Both the first and second compartments are remarkable for the presence of a number of pouches or cells in their walls, with muscular septa, and a sphincter-like arrangement of their orifices, by which they can be shut off from the rest of the cavity, and into which the fluid portion only of the contents of the stomach is allowed to enter." Such is the celebrated arrangement by which the camel stores in its stomach more water than it can immediately use, and by gradually using it is able to make far longer journeys across arid regions than otherwise would be possible. This has customarily been regarded as a very striking special provision for the needs of the camel of the desert; but it is equally characteristic of the

llamas, which inhabit well-watered regions, and has evidently descended to both from a remote common ancestry, regardless of present environments. See ALIMENTARY SYSTEM.

The structural evolution of the camel recalls that of the horse. (See EQUIDÆ.) In the old-



FEET OF FOSSIL CAMELS.

Bones of the feet, showing progressive development towards increase of size, union of metapodials, etc.: 1, *Prototylops* (Eocene); 2, *Poebrotherium* (Oligocene); 3, *Gomphotherium sternbergi* (John Day beds); 4, *Gomphotherium cameloides* (Loup Fork beds); 5, *Procamelus* (Loup Fork beds). (After Wortman.)

est Tertiary rocks of the ancient lake region of the Rocky Mountains, at the dawn of the Eocene, have been found diminutive remains suggesting this type, and in the Upper Eocene fossil skeletons undoubtedly cameloid. These belong to an animal (*Prototylops*) hardly larger than a jack rabbit, yet camel-like in many particulars. It had four distinct toes, of which the third and fourth were most useful, while the lateral second and fifth were smaller; the metapodial bones were disconnected, and there was no space between the bunodont molars and the front teeth, where the canines and incisors were alike. By changes that went on analogous to those in other ungulates, there is found in subsequent cameloid forms increase in size, and a constant tendency towards acquiring the dentition and pedal anatomy characterizing modern forms. The next advanced form is greater in size, and the lateral toes, no longer useful, hang to the side of the foot above the ground like a deer's. A steady increase of size goes through the ascending formations of the Miocene, until we reach *Procamelus*, at the top of the Miocene (Loup Fork beds of Wyoming), which was as big as a sheep and very llama-like, with teeth nearly of modern type and the metapodial bones

firmly united when fully adult. During the Miocene the western American plateau seems to have been an arid desert, and under such conditions were developed the large, splayed feet, bereft of the useless side toes, the great sole pads, and the pouched stomach that characterize the race. At the close of the Miocene, however, there came about a steady change towards a warmer, moister climate, inducing forest growth, which put an end to camel life in North America. Meanwhile they had migrated into South America, where fossil remains of great size are found, and where the family still survives, in the modified and perhaps degenerate forms of the llamas; and also northwestward to Siberia, and thence into Central Asia, where their remains are found in the Pliocene rocks of India, but not earlier. Here the conditions were favorable, and the modern camels seem to have developed. It thus appears that North America was the original home of the Camelidae, and that they "were derived from piglike animals quite independently of the true ruminants." For particulars as to American fossil camels, consult Wortman, *Bulletin American Museum Natural History*, vol. x (New York, 1898).

CAMELINA (Neo-Lat., probably from Gk. *χαμλ*, *chamai*, on the ground + *λινον*, *linon*, flax). A genus of cruciferous plants embracing about a dozen species, most of which are European. *Camelina sativa* is cultivated in Europe and Asia for the oil contained in the seed. The stalks contain a kind of fibre, which is sometimes used for making brooms. The plant has become introduced into the United States, where it is known as false flax, or gold of pleasure, and is considered a bad weed. See GOLD OF PLEASURE.

CAMELLIA (Neo-Lat., named after Joseph Kamel, a Moravian traveler of the seventeenth century, who first described the *Camellia japonica*, now *Thea japonica*). A species of plants of the family Theaceae, nearly hardy evergreen shrubs or trees, and natives of China, Japan, and the north of India. Camellias are now extensively cultivated as greenhouse shrubs in Europe and in the United States. Many varieties are in cultivation. The best known and most esteemed is *Thea japonica*, a greenhouse shrub. Its leaves are ovate-elliptical, almost acuminate and serrate shining; the flowers are without stalks, mostly solitary, large, and roselike. It is a native of Japan, and there and in China it has been carefully cultivated from time immemorial. In its wild state it has red flowers, and the red single camellia is much used by gardeners as a stock on which to graft the fine varieties, the flowers of which are generally double. The colors of the cultivated forms are various, including red, white, and yellow, and the varieties also differ much in the form and position of the petals. The flowering time is in autumn, winter, and spring. Camellias grow best in cool houses. Free access of air is of great importance, and water must be given very liberally, yet, with such caution that the soil may never remain soaked after the immediate wants of the plant are supplied. The proper soil for camellias is a loose black mold; a little sand and peat are often advantageously mixed with loam to form it. Camellias are often propagated by cuttings, or layers, but generally by grafting or inarching. The single camellia is also propagated by seed, and in this way the best stocks for grafting are procured. Of the other species of camellia, the most hardy, and one of the most

beautiful is *Thea reticulata*. The seeds of certain varieties, as *Thea oleifera* and *drupifera*, are used in China for the production of an olive-like oil. The true tea plant (*Thea sinensis*) is a close ally of the camellia. See TEA.

CAMEL'OPARD. See GIRAFFE.

CAMEL'OPAR'DALIS (Gk. *καμηλοπαρδαλις*, *kamelopardalis*, giraffe, literally camel-pard, from *κάμηλος*, *kamelos*, camel + *πάρδαλις*, *pardalis*, pard). A northern constellation defined by Jakob Bartsch, Kepler's son-in-law and assistant. It is situated between the polestar, Auriga, Cassiopeia, and the head of Ursa Major, and consists of stars of moderate magnitudes, forming, in imagination, the shape of a giraffe.

CAMELOT, or **CALBURY**, *kāl'bēr-i*. A steep hill in the parish of Queen's Camel, Somersetshire, England, 5 miles from Ilchester (Map: England, D 5), identified by tradition with Camelot, one of the capitals of the legendary King Arthur (q.v.). Others state that Camelot was the name given in the mediæval romances to the city which grew up out of the permanent quarters of the second Augustan legion at Caerleon-upon-Usk.

CAMELOT. The legendary site of King Arthur's castle and court. It has been variously located in Somersetshire, at or near Winchester, Hampshire, and in Wales. Shakespeare favored the first, Tennyson and Capell the second, and Caxton the third site. The monks of Glastonbury were chiefly responsible for the "Somerset" theory, which they maintained, especially in the fourteenth century, for the purpose of attracting pilgrims and thus enriching their abbey. It is often mentioned in English literature, notably in *King Lear* and *The Lady of Shalott*.

CAMEL'S HAIR. A fabric woven from the hair of the camel, by Persians and Arabs. In early ages garments of this stuff were worn by monks for penance. It is now imported into Europe and used extensively in the manufacture of dress materials and rugs. Cow's hair is sometimes used as a substitute in the cheaper grades of so-called camel's-hair goods. A fine grade of camel's hair is used for artists' brushes. Camel's hair proper is longer than some sheep's wool and varies considerably in color, being chiefly red, white, or gray.

CAMEN, *kā'men*, or **KAMEN**. A town in the Province of Westphalia, Germany, on the Seseke, 10 miles southwest of Hamm. It is a thriving industrial centre, with coal mines, paper mills, shoe manufactories, and iron foundries. Pop., 1900, 9888; 1905, 10,429; 1910, 10,754.

CAMENÆ (Lat.). In Roman mythology, nymphs possessing the power of prophecy. They had a sacred grove in Rome, just outside the Porta Capena. (See EGERIA.) Etymologists incline now to connect the name with a root signifying 'brightness,' and to regard the Camenæ as goddesses of fountains or springs. The Romans, however, connected the name with *car-men*, song, and *cano*, to sing; hence the Roman poets often apply the name *Camenæ* to the nine Muses of Grecian myth.

CAMEO (It. *cammeo*, Fr. *camée*, ML. *cameus*, or *cammeus*). Gems cut in relief are called cameos. The term is applied more especially to those diminutive pieces of sculpture which are prepared from precious stones having two strata or layers of different colors, the undermost of which is left to form the background, the object to be represented being cut in the upper one.

True cameos were probably not made before

CAMELLIA, ETC.



1. CAPER PLANT (*Capparis spinosa*), showing edible buds.
 2. CANARY SEED GRASS (*Phalaris Canariensis*).
 3. BLUEBELLS (*Campanula rotundifolia*).
 4. CARAWAY SEED (*Carum caria*).
 5. CAMELLIAS (*Camellia Japonica*), single and double.
 6. CANNAS OR INDIAN SHOT (*Canna indica* var.).

the third century B.C., though in very early times we find the backs of seals decorated with figures in relief; so especially in the *scarabæi*, seals decorated on the back with the sacred beetle of Egypt. As precious stones were used in the Orient and among the Greeks after the conquests of Alexander for many decorative purposes, the Greek artistic sense sought to raise this decoration to a higher plane, and this seems to have led to the carving of the gems into reliefs. At this period cameos were very extensively used, not only as personal ornaments, but in cups, vases, candelabra, and other objects of domestic luxury. Paternæ and other vessels were frequently worked out of a single stone, upon which were exhibited a whole series of figures of the most exquisite workmanship. Many of the antique cameos which have been preserved are wonderfully beautiful, both in design and execution. Of the Alexandrian cameos, probably the finest is the "Tazza Farnese," a shallow dish (8 inches in diameter), cut from a single sardonyx, now in the National Museum at Naples. Within, this dish shows an allegorical design, relating to a flood of the Nile; outside, it bears a Gorgon on an ægis (q.v.). Other very fine specimens of the early period are the Gonzaga cameo in St. Petersburg and a companion in Vienna, containing the portraits in profile of a man and a woman. These are commonly said to be portraits of Ptolemy II and his Queen, Arsinoë, but Furtwängler held that they represented Alexander the Great and Olympias (see Plate 53, in his work named at the close of this article). Of cameos of the Roman time, many fine specimens are to be found in the continental museums. Especially noteworthy are the Gemma Augustea in Vienna, and the Sainte Chapelle onyx in Paris: both show Roman emperors, Augustus and Tiberius, triumphing over barbarians (see below). Very celebrated is the "Cupid and Psyche" formerly in the Marlborough collection, now in the Boston Museum of Fine Arts, by Tryphon, who is supposed to have lived in the time of Augustus. Many of these cameos are of surprising and, in modern times, unequalled size and perfection. Cameos do not seem to have been made in mediæval times; but the art was revived in Italy, under the auspices of the Medici, and the production of cameos, both in *pietra dura* and in shell, has there become a branch of art manufacture of considerable importance. Impressions from antique cameos in glass, sulphur, porcelain, and other materials are produced in many places and, for artistic purposes, possess all the value of the originals.

The manufacture of cameos from artificial substances was not unknown to the ancients. One of the most beautiful specimens of an imitation of cameo in glass is the famous Barberini or Portland vase, now in the British Museum. The ground is blue, the figures, which are in low relief, being of a delicate, half-transparent white. (See PORTLAND VASE.) Another example is a beautiful vase, similar in color, known as the Blue Glass Vase, now in the Naples Museum, the figures of which represent a Bacchanalian sacrifice. Consult Mau-Kelsey, *Pompeii: Its Life and Art*, pp. 415-416 (New York, 1902). The vase was found in a tomb, outside the Herculaneum Gate at Pompeii. Many fragments of the same kind of manufacture exist in other cabinets, and from it the modern Wedgwood ware was imitated.

A shell cameo is a cutting in relief on a precious stone or a shell. It is opposed in meaning to intaglio, which signifies a cutting into the stone or shell. In intaglio work, furthermore, only gems of a uniform color are used, while in cameo engraving or cutting it is desirable to choose such stones or shells as possess layers of varying colors, such as sardonyx, onyx, agate, or tropical sea shells. These differing tints are skillfully utilized by intelligent engravers, so that at different depths of the cutting very beautiful and effective gradations of color are obtained. Shell, perhaps, gives the most delicate results, owing to the nearness of the color to that of flesh, and the general use made of the human figure and head as subjects for cameo engraving.

Inasmuch as Egypt was the birthplace, as it were, of belief in amulets, charms, and phylacteries of all kinds, it naturally came to pass that it was the earliest country to develop and to encourage the production of these emblems which, for the individual, possessed a magical and religious significance. From the time of the dynasties of the first Pharaohs to the period of the domination of the Romans, the inhabitants of the valley of the Nile, men and women, all wore about the neck, on the finger, or hung somewhere on their garments, cut or engraved gems of a talismanic character, which also served in some sort as a personal seal. It is safe to say that no country of ancient times has produced in such profusion precious stones in relief and in intaglio. It was in the Greek and Roman period that the cameo reached its perfection. The century of Scopas, Praxiteles, Lysippus, and Apelles produced an artist in gems whom all antiquity praises, but from whom there has not come down to us a single signed work. This artist is Pyrgoteles. Pliny and many others speak of him as the ablest engraver of all time, and place him in the same rank as the above-mentioned sculptors and painters. Pyrgoteles probably engraved several portraits of Alexander in cameo and intaglio, though none can be authenticated. Although cameo is sculpture in miniature, we see by this that it engaged the talents of really great artists. Among the largest examples of ancient cameo work is the Sainte Chapelle agate in the Bibliothèque Nationale in Paris (of sardonyx, 12 × 10½ inches), representing the apotheosis of Augustus and the reception of Germanicus, after his return from Germany, by Tiberius, and the Vienna onyx (8½ × 7½ inches), bearing, in addition to other figures, an allegorical representation of the coronation of Augustus. These surpass, in size and delicacy of execution, the best modern productions in this art. See GEMS; AUGUSTUS, APOTHEOSIS OF.

Bibliography. Agostini, *Gemmae et Sculpturae Antiquae Depictæ ab L. Augustino* (Paris, 1685); Zanetti, *Le gemme antiche* (Venice, 1750); Marsh, *Cameo Cutting* (London, 1891); Thompson, "On the Working of Shell Cameos" in *Art Journal* (ib., 1898); Davenport, *Cameos* (ib., 1900); and especially Furtwängler, *Die Antiken Gemmen* (Leipzig and Berlin, 1900).

CAMERA (Lat., vault, from Gr. *kamara*, a vaulted inclosure, hence a chamber or room), IN. Behind closed doors, the phrase to describe judicial proceedings held in secret. The inquisitorial process of the civil law and of the ecclesiastical courts of England and the Continent was often and may yet in certain classes

of cases be conducted in secret. In the common law system of England and the United States, on the other hand, it has always been held to be of the essence of the administration of justice that it shall be conducted in public. Within reasonable limits of space and good order, any one who chooses may attend a trial or other judicial proceeding, and this characteristic of our judicial administration is jealously guarded as an invaluable safeguard of justice. It was one of the grounds of complaint against the famous or infamous English tribunal known as the Star Chamber (q.v.) that it violated this tradition and conducted many of its proceedings in secret. This requirement of publicity applies equally to civil and criminal cases but is not a necessary incident of the preliminary examination of an accused person before a magistrate, nor does it apply to the hearing upon which an indictment by a grand jury is founded. In the interests of public morality children may be excluded from certain classes of criminal hearings, and matrimonial proceedings of a scandalous nature may by consent of the parties or in some cases by order of the court be conducted *in camera*. Where proceedings are directed to be heard *in camera* it is in England a contempt of court to publish them. In the court of chancery it was formerly the practice to hold *in camera* proceedings affecting wards of court, lunatics, and, in some cases, family disputes. The practice is now, however, restricted to cases in which publicity would defeat the object of the suit, as in proceedings to restrain the publication of private letters or proceedings affecting a secret trade process.

CAM'ERA. See PHOTOGRAPHY.

CAMERA LU'CIDA (Lat., light chamber). A device fitted to the eyepiece of a compound microscope to enable the observer to trace upon a sheet of paper the magnified image of the object as seen. It is constructed in various forms, the simplest of which is a small plate of glass attached to the eyepiece at an angle of 45° , as shown in Fig. 1. A portion of a slide or cover glass fixed to the eyepiece with wax can be employed for this purpose. In using the camera lucida, the tube of the microscope is placed in a nearly horizontal position, and a

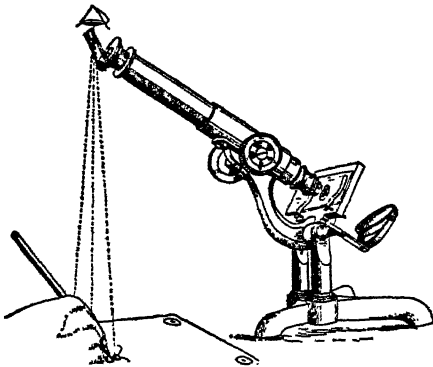


FIG. 1. SIMPLE CAMERA LUCIDA.

sheet of paper laid on the table beneath the eyepiece. The rays coming through the eyepiece are reflected into the eye from the glass, though coming apparently from the paper below, where an enlarged image of the object is seen. The outline of the image can readily be traced with

a pencil, and in this way an accurate representation of the object can be quickly made. Instead of the simple mirror of glass, Sommering employed a flat, circular piece of polished steel or speculum metal, whose diameter was somewhat smaller than that of the pupil of the eye. The rays are reflected vertically, and enter the eye,

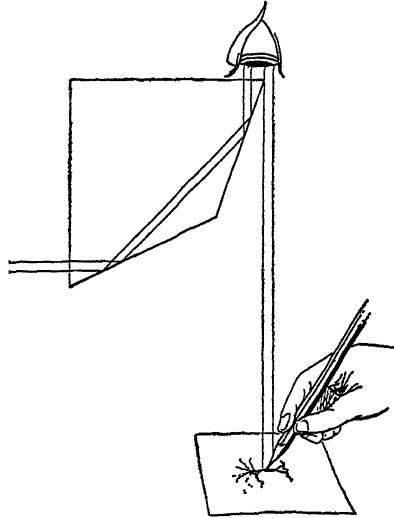


FIG. 2. WOLLASTON'S CAMERA LUCIDA.

as do also those from the paper which come to the eye, after passing by the edges of the mirror. A prism, so constructed that total reflection occurs one or more times, is often employed, and the arrangement of Wollaston, which is frequently used, is illustrated in the figures and described below. It consists of a small quadrilateral prism of glass, which Fig. 2 shows in perpendicular section, held in a brass frame, which is fitted in front of the eyepiece by a suitable mounting, or attached to an upright rod, having at its lower end a screw clamp, to fix it to the edge of a table. The prism, being at the height of about a foot from the table, has its upper face horizontal. Two of its faces, as in the figure, are at right angles; the contiguous faces make respectively with them angles of $67\frac{1}{2}^\circ$, so that the remaining obtuse angle contains 135° . Rays coming from an object and falling nearly perpendicularly on the first surface enter the prism, and undergo total reflection at the contiguous surface; they then fall at the same angle on the next surface, and are totally reflected again; finally, they emerge nearly perpendicular to the remaining surface. An eye, as in the figure, then receives the emergent pencil through one part of the pupil, so that an image of the object is seen projected upon a sheet of paper upon the table. The rays from the paper and pencil passing the edge of the prism enter the other part of the pupil; and the pencil and image being seen together upon the paper, a sketch of the latter can be made. There is, however, a practical difficulty—the image and the drawing pencil are at distances sensibly different from the eye and so cannot be seen together distinctly at the same time. To obviate this, a plate of metal, with a small aperture, as an eyehole, is placed at the edge under the eye, so that the rays through the prism

ment has since become familiar in the form of an optical toy, shown in diagram in Fig. 2, though the same principle has been made use of in certain pieces of scientific apparatus. The camera obscura in its simple form of lens and screen, suitably incased, was first used for pho-

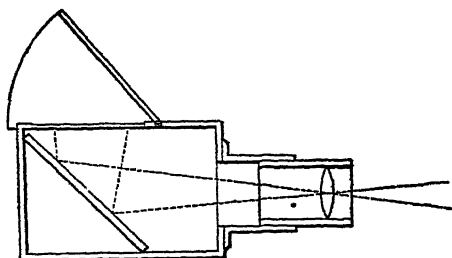


FIG. 2. CAMERA OBSCURA.

tographic work by Humphry Davy in 1802, at a time when he was engaged in experiments with Wedgwood. After this, the camera obscura was used by all the early experimenters in photography (q.v.), and the instrument has since then developed and amplified to a remarkable degree. The photographic camera is constructed in an almost infinite variety of styles, depending in the main on the purpose for which it is to be used. In general, it consists of two boxes, joined by a flexible and light-proof material, such as a bellows of leather, rubber, or

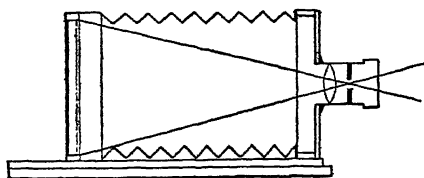


FIG. 3. SIMPLE PHOTOGRAPHIC CAMERA.

cloth, and susceptible of being moved towards or from each other, so that the distance between the lens and focal plane or position where the image is received can be varied. In one of these boxes, or on an upright board taking its place, the lens is mounted, and on the other there is a frame carrying a piece of ground glass which, at the time of taking the picture, is removed and the sensitive plate or film substituted. This is contained in a holder so constructed that the sensitive surface occupies the same position as the original focusing glass.

The construction of a camera varies with the use or process for which it is intended. Thus, for out-of-door work portability and rapidity of adjustment are essential, whereas in a studio or laboratory rigidity and adaptability are demanded. A view camera does not require any considerable length of bed, or base, as the ground glass is never distant from the lens a much greater amount than the principal focus (q.v.), as the pictures are generally on a reduced scale. If a camera, however, is designed for copying or enlarging, then it must have a long bed, as the distance from the lens to the ground glass will be as many times greater than the distance between the original object and the lens as it is desired to enlarge the picture. Frequently in the case of hand cameras the ground glass is omitted, and the proper focus is obtained by reference to a graduated scale on the bed, on

which are marked the foci corresponding to different distances.

The use of films and increased ease of manipulation has made photography universally popular, and there are almost as many styles of cameras as there are individual tastes. See PHOTOGRAPHY.

CAMERARIUS, JOACHIM (1500-74). A distinguished German classicist, born at Bamberg, of a family which originally bore the name Liebhard; for this Camerarius (Ger. *Kammermeister*) was substituted, since the office of chamberlain to the Prince-Bishop of Bamberg was hereditary in the family. At the age of 13 Camerarius entered the University of Leipzig. In 1518 he began to teach Greek at Erfurt, but in 1521 he moved to Wittenberg, where he attached himself to Melanchthon. At the latter's recommendation he was appointed to teach Greek and history in Nuremberg in 1526. Nine years later he was called to the University of Tübingen as professor of the Greek and the Latin literatures. In 1541 he went to Leipzig, where he continued to lecture until his death. He contributed to the eminence of this university, not only by his teaching and writing, but also by the practical measures of university reform which he, with certain associates, was able to carry through. He was especially distinguished for his critical judgment, in which he surpassed Melanchthon, while his knowledge of the classics was not inferior to that of his friend, so that he deserves to be regarded as the greatest German classicist of his century. His works were very numerous. Besides biographical and theological writings, the most important are the following editions: *Homerio Poems*, with the so-called scholia of Didymus (Basel, 1541); *Greek Elegiac Poets* (Basel, 1550); *Theocritus* (Frankfurt, 1545); *Sophocles* (Basel, 1556); *Herodotus* (Basel, 1540 and 1557); *Thucydides*, with the scholia (Basel, 1540 and 1557); *Theophrastus* (Basel, 1541). He was also coeditor of the edition of Galen, published by Cratander (Basel, 1538 et seq.). After Camerarius' death a number of Greek works and Latin translations were published by his relatives. Among the Latin authors edited by him should be named Quintilian with Commentary; Cicero (Basel, 1540); many separate works between 1542 and 1558; above all, his edition of Plautus (Basel, 1552), for which he employed the so-called *Codex Vetus Camerarii* and the *Codex Decurtatus*, and thus for the first time secured a definite basis for the text. A full list of his works may be found in Pökel, *Philologisches Schriftstellerlexikon* (Leipzig, 1882). Consult Bursian, *Geschichte der klassischen Philologie in Deutschland*, pp. 185-90 (Munich, 1893), and Sandys, *A History of Classical Scholarship*, vol. ii (Cambridge, 1908).

CAMERARIUS, RUDOLF JAKOB (1665-1721). A German botanist and physician, professor of medicine and director of the botanic garden at Tübingen. He was the first to recognize sexual differences in plants and make successful investigations of their reproductive organs.

CAMERINO, kāmā-rē'nō (Lat. *Camerinum*). A city in the Province of Macerata, central Italy, with a bishopric dating from 252 and an archbishopric dating from 1787, between the Chienti and the Potenza, about 35 miles southwest of Ancona (Map: Italy, H 4). The cathedral, built in 1832, occupies the site of a temple of Jupiter. The town possesses a university, founded in 1727. There are also the archie-

piscopal palace, the ducal palace, the new palace, and a bronze statue of Sixtus V, erected in 1587. The chief industry is silk growing. Pop., 1881, 12,000; 1901, 12,542; 1911, 11,689.

CAMERINUM. See CAMERINO.

CAM'ERLEN'GO, or **CAM'ERLIN'GO** (It., chamberlain). The Camerlengo of the Holy Roman church, generally a cardinal, controls the finances and the secular interests of the Pope. During a vacancy in the holy see he is sole head in things temporal and presides over the apostolic chamber or palace. In things spiritual, however, he is assisted by the other cardinals. There is also (2) a Camerlengo of the sacred college of cardinals, and (3) of the Roman clergy.

CAM'ERON. A city in Clinton Co., Mo., 50 miles north-northeast of Kansas City, on the Chicago, Burlington, and Quincy and the Chicago, Rock Island, and Pacific railroads (Map: Missouri, B 2). It is the seat of Missouri Wesleyan College. The city has a glove factory and dairying interests. The municipality owns the electric light and water works. Pop., 1900, 2979; 1910, 2980.

CAMERON. A city and the county seat of Milam Co., Tex., 53 miles south of Waco, on the San Antonio and Aransas Pass and the Gulf, Colorado, and Santa Fe railroads (Map: Texas, F 4). It is an agricultural region, containing deposits of timber and coal. The chief industries are cotton growing and stock raising. Cameron was settled about 1875. The government is administered by a mayor, elected biennially, and a unicameral council. Pop., 1900, 3341; 1910, 3263.

CAMERON, AGNES DEANS (1863-1912). A Canadian journalist and educator, born and educated at Victoria, British Columbia. She was a teacher for 18 years, but early manifested a keen interest in Canadian national development and exploration, contributing articles on these subjects to several American and British periodicals. Although appointed associate editor of the *Educational Journal of Western Canada*, she was led by a wide range of interests into various fields; she undertook and successfully accomplished a journey of 10,000 miles to the Arctic Ocean, starting from Chicago and reaching her destination by way of Athabasca, the Great Slave Lake, and Mackenzie River, and returning by way of Peace River and Lesser Slave Lake. Her study of Canadian natural resources and her traveled observation enabled her to become a well-known lecturer in the United States, Canada, and Britain. In 1909 she was elected vice president of the Canadian Women's Press Club. She published *The New North* (1909) and *The Outer Trail* (1910). She died at Victoria.

CAMERON, ARCHIBALD (c.1771-1836). An American Presbyterian clergyman, born in Scotland. He studied at Transylvania Seminary, Lexington, Ky., was licensed to preach in 1795, ordained in 1796, and was installed over the churches of Akron, Fox Run, and Big Spring. For many years the only Presbyterian clergyman in a wide extent of territory, he was occupied with itinerant labors until 1828, when he figured in a great revival and became pastor of churches at Shelbyville and Mulberry. With the Rev. David Rice (1733-1816), his teacher in theology, he was a pioneer of the Presbyterian church in Kentucky. Among his publications are: *The Faithful Steward* (1806); *An Appeal*

to the Scriptures (1811); *A Defense of the Doctrines of Grace* (1816); *A Reply to Some Arminian Questions on Divine Predestination* (1822).

CAMERON, A(BNOLD) GUYOT (1864-). An American college professor, born at Princeton, N. J., and educated at Princeton University. He was professor of the French and German languages and literatures at Miami University (1888-91), assistant professor of French at Yale University (1891-97), professor of French at Princeton (1897-1905), and professor in New York University Summer School (1909). He edited several French texts, including selections from Loti, Coppée, France, Zola, and Maupassant, and lectured on literary topics.

CAMERON, SIR CHARLES (1841-). A Scotch journalist and politician, born in Dublin. He studied at Madras College, St. Andrews, and Trinity College, Dublin, and at the medical schools of Paris, Berlin, and Vienna, and from 1864 to 1874 edited the *North British Daily Mail*. From 1874 to 1885 he was member of Parliament for Glasgow, from the subdivision of the constituency in 1885 until 1895 sat for the College division, and in 1897 was elected for the Bridgeton division. He introduced into the House the resolutions whose carriage effected the reduction of minimum telegram charges from one shilling to sixpence. In 1893 and 1894, in accordance with Gladstone's programme, he introduced into the House bills for the disestablishment of the Scotch church. He was knighted in 1893.

CAMERON, SIR CHARLES ALEXANDER (1830-1921). An Irish physician and chemist. He was born in Dublin and was educated in Dublin and Guernsey and in Germany. In 1862 he became public analyst for the city of Dublin and in 1867 was appointed professor of hygiene and chemistry in the Royal College of Surgeons in Ireland. The following are a few of his valuable publications: *Elements of Agricultural Chemistry* (in collaboration with J. S. W. Johnston, 10th ed., 1897); *A Manual of Hygiene, Public and Private* (1874); *Lectures on Public Health* (1868); *Handy Book on Food and Diet* (1871); *The Prevention of Contagious Diseases* (1871); *History of the Royal College of Surgeons, Ireland* (1886).

CAMERON, CHARLES DUNCAN (?-1870). An English soldier and explorer. He participated in the Kaffir War of 1846-47 and afterward in the Crimean War, and served with distinction at Kars and subsequently, on special duty, at Trebizond. In 1860 he was appointed British Consul in Abyssinia, but he did not assume the duties of this office until early in 1862. In June of this year he proceeded from his residence at Massowah to Gondar, to deliver a letter and presents from Queen Victoria to King Theodore, but he was here thrown into prison by the King in 1864 for alleged interference in Abyssinian politics, and was held for two years, when he was surrendered to Rassam, the agent of the British government. Almost immediately, with Rassam and others, he was again imprisoned by King Theodore and was released only when a British force advanced to their rescue. Cameron's account of his experiences was published in the *Parliamentary Printed Papers* (1868-69).

CAMERON, DONALD (c.1695-1748). A Scottish chief, known as "The Gentle Lochiel." He was born at Achnacarrie, Lochiel, Inverness.

He supported the Young Pretender, Charles Edward, who landed in Scotland in 1745. When Lochiel suggested awaiting reinforcements from France, Charles taunted him into invasion of England. Lochiel took Edinburgh in September, 1745, distinguished himself at Prestonpans, marched as far south as Derby, returned to Scotland and captured Falkirk. Governed by his strict but just and humane discipline, his command gained honorable repute by their conduct and forbearance. He opposed the plan of the night attack on Cumberland's army at Culloden, where he was severely wounded. After vicissitudes, he escaped to France, where he was afterward master of horse to "the Young Chevalier." He is the hero of Campbell's poem, *Lochiel's Warning*.

CAMERON, SIR DOUGLAS COLIN (1854-). A Canadian manufacturer and politician, born at Hawkesbury, Ont. He was educated at the Vankleek Hill High School. In 1880 he removed to Manitoba, entered the lumber business, and soon had important mills in Manitoba, Ontario, and British Columbia. In 1902-05 he served as a Liberal member of the Ontario Legislature. He was afterward unsuccessful as a candidate for the Manitoba Legislature and also in 1908 failed to be elected for Winnipeg in the House of Commons. Notwithstanding these reverses his wealth and business standing made him prominent in provincial politics, and in 1911 he was appointed Lieutenant Governor of Manitoba. In 1914 he received the honor of knighthood.

CAMERON, SIR DUNCAN ALEXANDER (1808-88). An English soldier, son of Sir John Cameron (1773-1844), a distinguished general in the Peninsular War. He entered the Black Watch (42d Royal Highlanders) in 1825, became a colonel in 1854, and served with distinction in the Crimean War. He commanded the 42d at the Alma, and at Balaklava, and at the siege of Sebastopol took a prominent part in the assault upon the outworks. He commanded the troops in New Zealand in 1863, although he disapproved of the war, sympathizing with the natives. In 1864 he was made a knight commander of the Order of the Bath. He became lieutenant general in 1868 and general in 1874, and from 1868 to 1875 was governor of the Royal Military College at Sandhurst.

CAMERON, EDGAR SPIER (1862-). An American mural painter. He was born in Ottawa, Ill., and studied at the Academy of Design under Earle, at the Art Students' League, New York, under Dewing and Chase, and later in Paris, under several masters, especially Laurens, Benjamin-Constant, and Cabanel. On his return to the United States he was, together with Robert Reid and Walter McEwing, placed in charge of the execution of the mural paintings for the World's Fair in Chicago. His most important work has been mural painting, such as his decorations in the library of the Supreme Court, Springfield, Ill. Among his easel pictures are "Dreamland," exhibited at Berlin in 1910, "The Youth of Christ," his most important work, and "Glass Blowers." He was art critic and correspondent of the *Chicago Tribune* from 1891 to 1900, and a member of the international jury for the Paris Exposition in 1900. His wife, MARIE CAMERON, is a successful portrait and genre painter.

CAMERON, FRANK KENNETH (1869-).

An American chemist, born at Baltimore, Md., and educated at Johns Hopkins University. He was instructor in chemistry at Cornell in 1894-95, associate professor at the Catholic University of America in 1895-97, and instructor in physical chemistry at Cornell in 1897-98. In 1898 he was engaged as an expert by the United States Department of Agriculture, was made chemist to the division of soils in 1899, and later placed in charge of the laboratory of soil chemistry. Besides his bulletins of the division of soils his publications include: *An Introduction to the Study of the Soil Solution* (1910) and *The Soil Solution the Nutrient Medium for Plant Growth* (1911).

CAMERON, GEORGE FREDERICK (1854-85). A Canadian poet, born at New Glasgow, Nova Scotia. Educated at Queen's University, Kingston, he passed several years in the United States and then returned to Canada, becoming editor of the *Kingston News*. Cameron's verse was praised for its rhythm and cadence by Swinburne, Tennyson, and Matthew Arnold. Consult: *Lyrics on Freedom, Love, and Death*, ed. by C. J. Cameron (Boston, 1887); J. E. Wetherell, *Later Canadian Poets* (1893); Stedman, *Victorian Anthology* (New York, 1895).

CAMERON, HUGH (1835-). A Scottish genre, portrait, and landscape painter. He was born in Edinburgh and studied at the Trustees' Academy under Scott Lander, and later at the Royal Scottish Academy, where he first exhibited in 1854 and became academicien in 1869. His genre pictures represent interiors such as "Maternal Care" (Museum, Aberdeen), and "Auld Robin Gray"; or country idylls, like "The Village Well" (Aberdeen) and "Haymaker's Noon." They are carefully executed, warm in color, and full of naïve charm. He also painted a number of Italian scenes, of which "Peasants Returning from the Olive Groves," and "Child's Funeral on the Riviera" (Museum, Dundee), are especially deserving of mention. His later pictures are mostly beach scenes of far-reaching perspective flooded with sunlight and animated by bathers and children at play. One of the best known, "The Timid Bather" (Glasgow Museum), was exhibited at the Paris Exposition, 1900. Consult Caw, *Scottish Painting* (London, 1908).

CAMERON, IRVING HEWARD (1855-). A Canadian physician and surgeon. He was born in Toronto and was educated at Upper Canada College and Toronto University, where he graduated in 1874. Entering on practice in his native city he soon attained a high reputation as physician and surgeon. In 1898 he was elected president of the Canada Medical Association, in 1900 a fellow of the Royal College of Surgeons, London, and in 1905 a fellow of the Royal College of Surgeons, Edinburgh. He was also elected a member of the Société Internationale de Chirurgie, the American Academy of Political and Social Science, and the British Association for the Advancement of Science. He was one of the founders and early editors of the *Canadian Journal of Medical Sciences*, and became professor of surgery in the University of Toronto. He wrote the article on surgical tuberculosis in the *International System of Surgery*, and also various articles in the British and Canadian medical journals.

CAMERON, JAMES DONALD (1833-1918). An American capitalist and politician, known as "Don" Cameron. He was born in Middletown,

Pa., the eldest son of Simon Cameron (q.v.); graduated at Princeton in 1852, and engaged in banking and various industrial enterprises. As president of the Northern Central Railroad, he did great service to the Union cause during the Civil War. In 1876 he was appointed Secretary of War, and in March, 1877, succeeded his father as United States Senator. By successive reëlections he retained his seat until 1897, when he retired. He was prominent in the campaign of 1876, first as opposing the nomination of Blaine, and then in working for Hayes's election. But Hayes refused to continue him in the cabinet. In 1880 he was chairman of the Republican National Committee. Consult chapter 94 in McClure's *Old Time Notes of Pennsylvania* (Philadelphia, 1905).

CAMERON, JOHN (1579-1625). A Scottish scholar and divine. He was born in Glasgow and was educated at the university of that city, where, in his twentieth year, he held an appointment as reader in Greek. In 1600 he set out to travel in France, where his ability and erudition secured for him a philosophical professorship in the University of Sedan. He afterward acted as a Protestant clergyman in Bordeaux, and on the death of Gomarus (1618) was appointed to the divinity chair in the University of Saumur, an appointment he held until 1620, when, returning to Britain, he was appointed principal of the University of Glasgow (1622); but in less than a year he returned to Saumur; thence to Montauban, where he received a divinity professorship (1624). Here his opposition to the party who advocated a civil war made him many enemies, by one of whom he was stabbed in the street (May 13, 1625); and he died from the effects of the wound a few months later. He was considered one of the best scholars of his time; in biblical criticism he was inclined to be perverse; where there was a difficulty, he usually chose the opposite view to that held by other divines, especially Beza. He was a Calvinist, but less rigid than most of his contemporaries. His works are said to be the foundation of Amyraut's (q.v.) doctrine of universal grace; so he is called the founder of the moderate Calvinistic school of Saumur. His collected works were published with a memoir by L. Cappel (Geneva, 1642).

CAMERON, JOHN (1843-1908). A Canadian journalist. He was born at Markham, Ont., and was educated there and at London (Ont.). He engaged in the printing business and in 1863 founded the *Advertiser*, which became an influential organ of Liberal opinion in the western part of the province. In 1875 he also founded the *Liberal* in the interest of that section of the Liberal party led by Edward Blake (q.v.) in the earlier part of his career; but the paper was discontinued after a year. In 1882, after the death of George Brown (q.v.), he became editor of the *Globe*, Toronto, and continued in that position until 1890, when he returned to London. He was postmaster of that city at the time of his death.

CAMERON, JOHN DONALD (1858-). A Canadian jurist. He was born at East Nissouri, Ont., and was educated at Woodstock College and the University of Toronto, where he graduated in 1879 after an academic course of phenomenal range and brilliance. He studied law and was called to the Ontario bar in 1882; but removed to Manitoba, where he rapidly gained an extensive practice. In 1892-99 he

was a Liberal member of the Manitoba Legislature and also a member of the provincial administration, first as Provincial Secretary (1892-96) and afterward as Attorney-General (1896-99). At a time of much religious and political turbulence (1896) over the school question (see *MANITOBA, History*) he was one of the commissioners for Manitoba to arrange a settlement with the Dominion authorities. In 1908 he was appointed a judge of the Court of King's Bench, and in 1910 a judge of the Court of Appeal.

CAMERON, JOHN HILLYARD (1817-76). A Canadian lawyer and statesman. He was born in Beaucaire, Languedoc, France, but came to Upper Canada with his father in early youth and was educated at Upper Canada College, Toronto. He studied law, was admitted to the bar in 1838, and soon gained a high professional reputation. He was appointed reporter to the Court of Queen's Bench in 1843, and thus began the regular record of judicial decisions in Upper Canada. In 1840 he was a commissioner for revising the Upper Canada statutes, and in 1856 a commissioner for consolidating the statutes of Canada. In 1846 he was elected a Conservative member of the Legislative Assembly, and the same year was appointed Solicitor-General for Upper Canada in the administration of William Henry Draper (q.v.). An interesting occurrence in the history of Canadian cabinet government took place in 1847, when Cameron was admitted to a seat at the council board, the first instance of a solicitor-general being thus distinguished. During his legislative term he procured the exemption from the British income tax of the property of colonists in Britain, and also improved postal facilities by securing the carriage of American mails by Canadian packets. He was a staunch adherent of the Church of England in Canada, and effected the removal of disabilities which prevented the free action of its synods. He was one of the founders, and afterward a professor in the law faculty, of Trinity University, Toronto. He published: *Digest of Cases Determined in the Upper Canada Courts* (1844); *Rules of Court Relating to Pleading in the Court of Queen's Bench* (1845); *Reports of Cases Determined in the Queen's Bench* (1846).

CAMERON, MALCOLM (1808-76). A Canadian statesman. He was born in Three Rivers, Province of Quebec, and in his youth was denied all educational advantages, commonly so-called, except attendance during one winter at a district school. At different times farm boy, stable boy, brewery clerk, and country storekeeper, he improved every available interval by serious study, and before he was 21 years old had formed Radical opinions on Canadian political questions. He soon removed to Upper Canada and in 1836 was elected a Liberal member of the Legislative Assembly. He vigorously opposed the oligarchical rule, political and sectarian, which was then exercised by the Tories, and demanded responsible government and the secularization of the clergy reserves. (See *CANADA, History*.) He did all he could to promote the union of Upper and Lower Canada in 1841. In the second Baldwin-Lafontaine administration he became Assistant Commissioner of Public Works (1848), but resigned in 1849 and allied himself with the advanced wing of the Liberal party known as Clear Grits (see *POLITICAL PARTIES, Canada*), of which he was one of the founders. In the Hincks-Morin administration, in which

the more radical sections of Liberal opinion were represented, Cameron was appointed in 1851 President of the Council, and afterward Minister of Agriculture and then Postmaster-General. After the defeat of the Hincks-Morin government he was in political retirement for three years, and was then elected to the Legislative Assembly, in which he supported the moderate Conservative Macdonald-Cartier administration. After the Legislative Council was made elective, he became a member in 1860. Later he was again elected to the Legislative Assembly and remained a member until his death. Throughout his public life he was a firm advocate of the temperance cause.

CAMERON, SIR MATTHEW CROOKS (1822-91). A Canadian jurist and statesman. He was born in Dundas, Ontario, was educated at Upper Canada College, Toronto, and was called to the bar in 1849. He rose rapidly in his profession and gained a large practice. In 1861 he was elected a Conservative member of the Legislative Assembly. He was defeated in an electoral contest for that body in 1863, but was successful in the following year. After confederation in 1867 he was a candidate for election to the House of Commons, but was defeated and subsequently entered the cabinet of John Sandfield Macdonald (q.v.), the first Premier of Ontario, as Provincial Secretary and Registrar. In 1871 he became Commissioner of Crownlands, remaining in that office until the defeat of the Macdonald administration in 1871. He was then elected leader of the Ontario Conservative opposition, and held that position four years. In 1878 he was appointed a puisne judge of the Court of Queen's Bench, and in 1884 Chief Justice of the Court of Common Pleas, a position which he retained until his death.

CAMERON, RICHARD (?-1680). A Scotch minister, born in Falkland, Fife. He was founder of the sect of Cameronians, a term popularly applied to but declined by the Reformed Presbyterians. The son of a tradesman, he was an apt pupil at the village school, and while still a youth became schoolmaster and precentor. He espoused the cause of the itinerant field preachers and, possessing natural eloquence, was licensed and admitted to their numbers. In 1678 he joined banished friends in Holland, but returned in 1680, and with others strenuously resisted the measures that reinstated the Episcopal church in Scotland and proscribed the meetings for public worship of unauthorized religious bodies. He persisted in preaching in the fields and antagonized the government by an attitude of defiance. In June, 1680, with 20 well-armed companions, he entered the town of Sanquhar and in the market place formally renounced allegiance to Charles II, for abuse of power, and declared war against him and his adherents. He retired to the hills between Nithsdale and Ayrshire, and succeeded in evading capture for a month, though a price of 5000 marks was set upon Cameron's head by the government, and 3000 for the heads of the other leaders. They were surprised by a superior force in Aird's Moss, July 20, 1680, and after a brave fight Cameron was killed. His hands and head were cut off and fixed upon the Netherbow Port, Edinburgh. The followers who escaped were induced by the Edinburgh Convention of 1689 to assist in the revolution, and formed the nucleus of that renowned regiment of the British army called the Cameronians (q.v.). Consult

Herkless, "Richard Cameron," in *Famous Scots Series* (New York, 1896).

CAMERON, SIMON (1799-1889). An American politician. He was born in Donegal, Pa., was a painter and then an editor in Doylestown and Harrisburg, and early in life was prominent in politics, but, because of his iron interests, was a Protectionist. In 1838 he was commissioner to settle accounts with the Winnebago Indians and was accused of swindling them. When Buchanan resigned from the Senate to become Secretary of State, Cameron was elected (1845) his successor over George W. Woodward by a Democratic bolt and fusion with the Whigs. When his term expired (1849), he became a leader of the People's party and fused it with the new Republican party, and was again elected to the Senate in 1857, with the aid of several Democratic votes. In 1860 he was a prominent candidate for the presidency in the national Republican convention, and in 1861 was appointed Secretary of War, though his appointment was bitterly opposed by many men of prominence. Apparently Lincoln's managers in the nominating convention had secured Cameron's influence there by promising him a portfolio in Lincoln's cabinet. Soon after becoming a member of the cabinet he expressed himself in favor of arming fugitive slaves, a policy which President Lincoln then opposed, and, much evidence being adduced in Congress to prove corruption in the department in letting contracts, he was asked, in January, 1862, to resign his portfolio. (See *UNITED STATES, History, Lincoln's Administration*.) From then until November of the same year he was United States Minister to Russia. In Pennsylvania in 1864 he successfully opposed Stevens and others who sought to defeat Lincoln's renomination; and he aided Lincoln in bringing about the nomination of Andrew Johnson for Vice President. He was chosen United States Senator in 1867 (over Curtin) and again in 1873. During the Hayes administration he opposed the executive policy of civil-service reform, and in 1877 resigned his seat in order that his son, James Donald Cameron (q.v.), might be elected in his place, thereby virtually keeping in the family the almost entire control of the Republican party in Pennsylvania, which he had gained in 1866. The dictatorship was transferred in turn to M. S. Quay and Boies Penrose (qq.v.). Cameron was the first powerful State "boss" in American politics; his character is suggested by his definition of an honest politician as "one who will stay bought when he is bought." Consult McClure, *Old Time Notes of Pennsylvania* (2 vols., Philadelphia, 1905).

CAMERON, VERNY LOVETT (1844-94). An English explorer. He was born near Weymouth, Dorsetshire, entered the British navy in 1857, and saw service on the east coast of Africa. In 1873 he was sent by the Royal Geographical Society on a second expedition to relieve Livingstone. In August Lieutenant Cameron met Livingstone's servants bearing their master's body to the coast. Cameron pushed on, and was the first European to cross tropical Africa from east to west, reaching the Atlantic in November, 1875. He found some of Livingstone's papers, explored the southern half of Lake Tanganyika, and learned that the Lualaba was really the Upper Congo. On his return he received many honors, was promoted to commander in the navy, and published *Across*

Africa (2 vols., 1876; 2d ed., 1885). In 1878-79 he traveled in Asiatic Turkey and on his return published *Our Future Highway* (1880), advocating a railway from Tripoli to India. In 1882, with Sir Richard Burton, he visited the African Gold Coast in search of gold, and he was joint author of Burton's *To the Gold Coast for Gold* (1883). He wrote several juveniles.

CAM'ERONIANS. Followers of Richard Cameron (q.v.), of Scotland; officially known as Reformed Presbyterians. The organization dates from 1681, and, except a few seceding congregations, united with the Free church in 1876. They refused to take the oath of allegiance, or to take office, under the existing government. (See PRESBYTERIANISM.) They were moderate Calvinists and asserted that the will of man is determined only by the practical judgment of the mind; that the cause of men's doing good or evil proceeds from the knowledge that God infuses into them; and that God does not move the will physically, but only morally, by virtue of its dependence on the mind.

CAMERONIANS (from Richard Cameron, q.v.). A celebrated regiment of Scotch infantry in the British army. In the British army list it is described as "The Cameronians (Scottish Rifles), Regimental District No. 26; Depot and Record Office, Hamilton, N. B." The regiment consists of two battalions, each of about 1000 men of all ranks, and belongs to the oldest division of the British army. In its origin it dates back to the time when the Covenanters were in arms for the defense of their faith and in many instances went armed to their public meetings. Consult Cunningham, *Church History of Scotland* (Edinburgh, 1883), and Burton, *History of Scotland* (London, 1873).

CAMEROON, kă'me-roon'. See KAMEBUN.

CAMICIANÆ AQUÆ. See CASTELTERMINI.

CAMILING, kă'mé-ling', SAN MIGUEL DE. A town of Luzon, Philippines, in the Province of Tarlac, 19 miles northwest of Tarlac. Pop., 1903, 25,243.

CAMIL'LA. In Roman fable, a virgin wonderfully swift of foot, who aided Turnus with Volscian forces against Æneas (Vergil, *Æneid*, vii. 803); she was slain by Arruns, an Etruscan ally of Æneas (see Vergil, *Æneid*, xi. 648-833). She was said to be a daughter of Metabus, King of the Volscian town Privernum (Piperno).

CAMILLE, kă'mêl' (Lat. *Camilla*). 1. The heroine of Corneille's *Les Horaces*. Her lover is one of the Curiatii killed by her brothers, as in the old Roman legend on which the play is founded. When she denounces the act, and the patriotism which caused it, she is stabbed by her brother. 2. The heroine and title character of the English adaptation of *La dame aux camélias*. Camille is Marguerite Gautier in the original.

CAMIL'LO (Lat. *Camillus*). 1. A Sicilian lord who, in Shakespeare's *Winter's Tale*, warns Polixenes of Leontes' designs against his life. He escapes to Bohemia with the former monarch and remains there until the reconciliation of Polixenes and Leontes at the close of the piece. He is instrumental in bringing about the marriage of Florizel and Perdita. 2. The husband of "the white devil" in Webster's play of the latter name. He meets his death through the agency of the Duke of Bracciano, who was the paramour of his wife. See ACCORAMBONI.

CAMIL'LUS and **CAMIL'LA** (Lat.). The

names applied in ancient Rome to the boys and girls who shared in sacrificial ceremonies, as attendants of priests and priestesses, especially the Flamen Dialis and his wife, the Flaminica. (See FLAMENS.) If they were designed for the priesthood, it was necessary that their parents should be still living and free-born.

CAMIL'LUS, MARCUS FURIUS (?-c.365 B.C.). A celebrated Roman patrician who first makes his appearance as consular tribune (403 B.C.). His military career was a series of unbroken successes, according to the accounts which have come down to us; but these accounts were shown by Niebuhr to possess a considerable admixture of mythological or poetic fiction. In 396 Camillus was made dictator, during the Veientine War, in which, in a siege of 10 years, he mined and captured the city of Veii; but the proud splendor of his subsequent triumph offended the Roman populace, who were still further displeased when Camillus demanded a tithe of the spoils of Veii, in order to fulfill a vow made to Apollo, on condition of victory. In 394 Camillus was again elected consular tribune, and besieged Falerii, whose inhabitants, after bravely defending themselves, were led, tradition said, by a magnanimous act of Camillus to yield unconditionally. Afterward Camillus, being accused of peculation and foreseeing certain condemnation, banished himself from Rome (391) and lived in retirement at Ardea, until Brennus, at the head of his wild Gauls, had swept through Etruria and captured and destroyed the whole of Rome except the Capitol. (See ALLIA; BRENNUS, 1; ROME, *History*.) Camillus was now recalled and appointed dictator a second time. He achieved a decisive victory over the invaders, rebuilt Rome, and obtained new victories over the Volsci and others. In 386 he was elected dictator for the third time, but refused the office. In 381 Camillus was victorious in the war of Rome against Præneste and other Latin towns; and in 368 he was elected to his fourth dictatorship, but abdicated during the same year. In 367, when war broke out with the Gauls, Camillus, though a very old man, accepted the dictatorship for the fifth time, defeated the barbarians near the site of Alba Longa, and made peace between patricians and plebeians, helping to pass the Licinian Laws. (See AGRARIAN LAW.) Consult Plutarch, *Camillus*. After this he erected near the Capitol a temple to Concord, and, having retired from public life, died about 365, of the plague, lamented by the whole Roman people.

CAMINATZIN, kă'mé-nă-tsen', or **CACU-MAZIN** (?-1520). King of Texcoco, nephew or cousin of Montezuma (Emperor of Mexico), and one of the leaders of the war party among the Mexicans after the capture of the Emperor by the Spaniards. Caminatzin successfully opposed every effort of Cortés to make peace with the natives of the city of Mexico, but was finally taken captive through the instrumentality of Montezuma. He perished on the night of the evacuation of Mexico by the Spaniards (the *noche triste*), June 30, 1520.

CAMISAARDS, kă'm'i-zărdz (Fr., from OF. *camise*, smock, less probably from Fr. *camisade*, attack by night). The active participants in the Protestant revolt of 1702 in the Cévennes, a mountainous region in southern France, against the persecutions that followed the revocation of the Edict of Nantes. (See NANTES, EDICT OF.) The Camisards belonged to the Romance-speak-

ing people of Gothic descent, who took part in the earliest movements towards religious reform. Calvin was warmly welcomed when he preached at Nîmes, and Montpellier became the chief centre for the instruction of Huguenot youth; but it was in the triangular mountainous plateau called Cévennes, and chiefly among the small farmers, the cloth and silk weavers, and the vinedressers, that Protestantism was most widely diffused. These people, who were of a hardy and inflexible character, not unlike the Covenanters of the Scottish Highlands, were imbued with the stern principles of Calvinism, readily kindled to the exhortations of their preachers, and were capable of a stubborn resistance. The Edict of Nantes of 1598 and the moderate and conciliatory policy of Richelieu had brought France relief from religious strife, but a new policy was introduced under Louis XIV, who, conceiving that the internal political exigencies of the realm demanded a uniformity of worship throughout its extent, concluded that he would no longer tolerate heresy. A policy of gradually destroying the privileges of the dissenters was begun. They were shut out from public offices and trade corporations; they were forbidden to marry with Roman Catholics, and the conversion of their children seven years old and upward was encouraged and almost enforced. In October, 1685, the Edict of Nantes was finally revoked. All dissenting churches were to be destroyed, religious meetings were forbidden under pain of imprisonment and confiscation of property: all pastors who would not stop preaching at once and change their faith were to be banished within 15 days; exemption from taxes and increased salaries were promised to converted ministers. Huguenot schools were suppressed, and all children were to be baptized and brought up in the Roman Catholic faith. All Huguenots, except ministers, were prohibited from going abroad, and the property of those who had already gone was declared forfeited unless they returned within four months. In carrying out this harsh decree the most savage persecution was indulged in. Torture, hanging, insults worse than death to women, the galleys and imprisonment for life were the ordinary occurrences for the next 60 years. (See DRAGONNADES.) The number of Huguenots who fled from France at this period has been estimated as high as 600,000; but a more conservative and reliable figure would place it at 250,000.

In the Cévennes, however, the people were too poor to escape, and all over Languedoc the Huguenots assembled for purposes of worship in secret. A religious ecstasy ran through the country, and so-called prophets appeared among the people. In connection with this phase of the excitement, there were noted those abnormal physical and mental conditions which always follow prolonged fasting and vigils under strong religious excitement. Louvois, Louis XIV's War Minister, determined to put down this movement in an exemplary manner. An army of 40,000 was raised, and forts were erected at Nîmes, St. Hippolyte, Alais, and Anduze. The Abbé du Chaila, a Roman Catholic missionary from Siam, had been appointed inspector of missions in the Cévennes. He became an object of particular aversion to the fanatics on account of his repressive measures in retaliation for their excesses and bold defiance. His assassination, July 23, 1702, was the first blow in the war. There was to have been a general massacre

of Roman Catholic priests, but the plan failed, and the originator, Esprit Séguier, soon fell. He was succeeded by La Porte, an old soldier, who, as his forces increased, assumed the title of Colonel of the Children of God and named his country the Camp of the Eternal. His captains were selected from those on whom the prophetic influence had fallen, such as the forest ranger Castanet, the wool carders Condère and Mazel, and the soldiers Catinat, Joany, and Ravenel; but the most famous were Roland and Jean Cavalier, the baker's boy (see CAVALIER, JEAN). For three years the Camisards held out. Against them was sent an army of 60,000 men, among them an Irish brigade, which had just returned from the persecution of the Vaudois. A policy of extermination was commenced, and in the Upper Cévennes alone 466 villages were burned and nearly the entire population put to the sword. The insurgents, on the other hand, indulged in acts of violence against the Catholic population and priesthood, of whom more than 4000 are estimated to have perished. Catholic churches were burned in large numbers. Clement XI issued a bull against the "execrable race of the ancient Albigenses," promising remission of sins to the holy militia which was now formed among the Roman Catholic population under the name of Cadets of the Cross. The formidable force brought against them induced Cavalier to listen to proposals, and he finally assented to a surrender on being guaranteed liberty of conscience, the right of assembly outside of walled towns, the liberation of all his people then in durance, and the restitution to emigrants of their civil rights and property. Still the greater part of the army, under Roland, Ravenel, and Joany, refused, and insisted upon the complete restoration of the Edict of Nantes. The Camisards continued the war until the beginning of 1705, at which time their leaders had been killed or dispersed and they had become disorganized. In 1711 all outward signs of the Reformed religion had disappeared, and on March 8, 1715, a few months before his death, Louis XIV, by a special medal and by proclamation, announced the entire extinction of heresy. Fourteen years afterward, in spite of the strictest surveillance, aided by military occupation, there had been organized in Languedoc 120 churches, which were attended by 200,000 Protestants. Persecution could not utterly suppress them; but it was not until 1775 that the last galley slave from Languedoc was liberated, and not until 1789 that the National Assembly repealed all the penal laws against Protestantism. Consult: Baird, "The Camisard Uprising," in *Papers of the American Society of Church History*, vol. ii (New York, 1890); Bray, *The Revolt of the Protestants of the Cévennes* (London, 1870); Smiles, *The Huguenots in France after the Revocation of the Edict of Nantes* (London, 1877); Goiffon (ed.), *Relation historique de la révolte des fanatiques ou des Camisards* (Nîmes, 1874); Louvreleuil, *Le fanatisme renouvelé* (Avignon, 1702-07); *Les bulletins de la Société de l'histoire du protestantisme français*. See CÉVENNES.

CAM'LAN. A famous battle in Arthurian legend. It saw the death of Arthur and the dissolution of the Round Table. Antiquarians place it in Cornwall, England, and set its date either in 537 or 542 A.D. See ARTHUR; also MODRED.

CAM'LET (Ar. *khamlat*, camlet, from *khaml*,

pile, plush; at an early period folk etymology wrongly referred it to *camel*). A fabric originally made of camel's hair, and more recently of the hair of the Angora goat, having a waved surface. Camlets are woven from wool alone, or from wool and cotton or linen mixed, and spun hard.

CAMMERHOFF, kām'mēr-hōf, JOHN CHRISTOPHE FREDERIC (1721-51). A Moravian bishop and missionary in America. He was born near Magdeburg, Germany; in 1746 became a bishop of the Moravian church and came to America, where until his death he acted as Bishop Spangenberg's assistant. He worked among the Indians, especially among the Iroquois, and made many converts. He was adopted into the Turtle tribe of the Oneidas, under the name "Gallichwio" ('A Good Message'), and for more than a generation was remembered with singular respect and veneration by the Indians of the Confederacy. His death was caused by exposures and hardships like those of his journey (1750) of 1600 miles to Onondaga.

CAMÕES, ká-moĩnsh', commonly written in English CAMOENS, LUIZ VAZ DE (c.1524-80). The greatest poet of Portugal, who exerted an important influence on the national drama and developed the Portuguese lyric to its highest perfection, but owes his fame mainly to the celebrated historical epic, *Os Lusíadas*. Son of a sea captain, who was early lost in a shipwreck, and descendant of a family of distinction and rank, Camões was born in Lisbon (more probably than in Coimbra) in 1524 or 1525 (with probability strongly in favor of 1524), about the time of the death of Vasco da Gama, to whom he was related, and whom his grandfather, Antão Vaz, had accompanied on his first voyage to India. He attended the University of Coimbra, where his uncle Dom Bento de Camões, the learned prior of the Monastery of Santa Cruz, became chancellor, the year of Luiz's entrance, in 1539. He early showed remarkable proficiency in the classics and in contemporary literature, presumably due to the guidance of this uncle. It was during these early days in Coimbra that Camões was inspired by some fair but unknown maiden, whom he celebrated in a series of canzoni, sonnets, and elegies, Petrarchian in form and Platonic in spirit, but notable for their purity of diction and grace of form. Having finished his studies, Camões took leave of Coimbra in a poem filled with most tender *saudade* ('longing': the peculiar note of much of his verse), and in 1542 went to Lisbon, where he frequented the court and conceived a romantic passion for Caterina de Athaide, one of the Queen's ladies of honor, whom he celebrated under the anagram of Natercia. The beginning of all his troubles was brought about by his having shown his affection too openly, thereby infringing some rule of court etiquette. Banished from the court and separated from the woman he loved, Camões joined the expedition of John III against Morocco, where he served two years, losing an eye during a naval engagement in the Strait of Gibraltar. On his return to Lisbon he found no more praise for his bravery than formerly for his poems. Disappointed in all his hopes, he determined to leave his native land forever, said a last farewell to Caterina, and sailed for India as a common soldier. For 16 years he led an adventurous life in the East, unprosperous for the most part, though for a time he held a lucrative

position at Macao, as administrator of the effects of deceased persons. But he misused his powers, made enemies by his writings, incurred debts, and suffered misadventures in love. At last he turned his steps homeward, and after disheartening delays and countless hardships reached Lisbon once more, in 1570, only to find it overrun with the plague, in the throes of the Inquisition, and governed by a young, feeble, and visionary monarch. Nevertheless he published his epic, the *Lusíad*, the only valuable possession which he had brought back from all his wanderings, and dedicated it to the young King, Sebastian, who was very gracious; but all the patronage bestowed upon the author was a niggardly pension of about \$20, and permission to frequent the court. Camões survived a few more troubled years, living with his aged mother. When Sebastian undertook the African campaign, his patriotic zeal flamed up once more, though he could not accompany the King either as poet—since Diogo Bernardes and Cortezale were preferred to him—nor as soldier, because too old. The news of the defeat of Alcacer-Quebir broke his heart. In a letter, the last lines that he wrote, he says: "It was not enough that I should die in my fatherland; I am dying with it." He died in a hospital in 1580, and his interment passed almost unnoticed.

The *Lusíad* (*Os Lusíadas*, The Lusitanians) celebrates the chief events in the history of Portugal, and is remarkable among modern epics for the admirable manner in which it has imitated the true national and popular spirit of ancient epic poems. Among the most famous passages are the tragic story of Inês de Castro, and the apparition of the giant Adamastor, who appears as the Spirit of the Storm to Vasco da Gama when passing the Cape. The metre of the *Lusíad* is the familiar *ottava rima* of the Italian poets, and the treatment of it is full of charm. The chief interest of the poem is due to the fiery spirit of patriotism which pervades it, and its intrinsic beauty has made it one of the masterpieces of what Goethe termed the "world literature." It has been translated into all the principal languages of Europe. Besides his epic, Camões wrote sonnets, odes, elegies, satires, epigrams, epistles, and three comedies—*Os Amphitryões*, modeled upon Plautus; *King Seleucus*; and *Filodemo*. The most complete edition of his works is that of the Visconde de Juromenha (6 vols., Lisbon, 1860-69); a cheaper and more convenient edition is that of Theophile Braga (3 vols., Oporto, 1874), also the edition by Carl von Reinhardtsoettner (Strassburg, 1874). For his biography, consult: Adamson, *Memoirs of the Life and Writings of Luis de Camões* (London, 1820); Braga, *Historia de Camões* (3 vols., Oporto, 1873-75); Castello-Branco, *Luis de Camões* (Oporto, 1880); Burton, *Camões: His Life and his Lusíads* (London, 1881); Storck, *Luis de Camoens Leben* (Paderborn, 1890). This *Life* by Storck made useless, except as bibliographical and historical curiosities, all the biographies that had preceded it. Consult also the translation of some of the poems by the Viscount Strangford, *Poems from the Portuguese of Luis de Camoens, with Remarks on his Life and Writings*, Notes, etc. (6th ed., London, 1810). For good bibliographies, consult: Camillo Castello Branco, *Manual bibliographico portuguez* (Oporto, 1878); Innocencia Francisco da Silva, *Diccionario bibliographico portuguez*, vol. v, pp. 239-277 (Lisbon, 1860),

and vols. xiv and xv (vols. vii-viii of the continuation by Brito Aranha, Lisbon, 1886-88), which are devoted exclusively to Camões and Camonian, the latter volume dealing at length with the tercentenary celebrations, and both volumes being fully illustrated.

CAM'OMILE. See CHAMOMILE.

CAMONICA, kâ-mô'nê-kâ, or **VALLE CAMONICA.** A picturesque valley in the Province of Brescia, north Italy, consisting of the basin of the Oglio River, inclosed by outlying and densely wooded ridges of the Rætian Alps. It extends for 50 miles from northeast to southwest to Lake Iseo (Map: Italy, E 2). It is a principal thoroughfare between Italy and the Tirol. It has iron, copper, and lead mines and marble and slate quarries. Its soil is fertile, and agriculture is well developed, maize, grapevines, and mulberry trees being extensively cultivated.

CAMORRA, kâ-môr'râ (Sp., contest, quarrel). A secret society with ramifications throughout the former Kingdom of Naples, which exerts considerable influence among the lower classes in that part of Italy, and whose activity extends to higher official quarters. The members are called Camorristi. The society was not political in its origin, but rather a fraternal organization started among the Neapolitan prisoners about 1820. Its chief object has always been extortion in some form. Under the Bourbons, Camorristi appeared in public places on all occasions of popular amusement and levied contributions which their victims dared not refuse. They undertook the transport of smuggled goods and contracted for the commission of serious crimes. Their readiness for violence and murder, and their close association among themselves, made them so much dreaded that Camorristi who had been thrown into prison succeeded in exacting money from their fellow prisoners and from the jailer himself. When at the height of its power, the society had a central rendezvous in every large provincial town and 12 in the city of Naples. Those who belonged to each of these sections of the society were under the absolute government of a chief elected by themselves, with whom was associated a treasurer. The latter had the charge of the common fund into which all the Camorristi of that section paid their entire gains for distribution according to a carefully worked out scale of percentages due different members and officials. Candidates for membership were obliged to swear upon an iron crucifix a fearful oath of fidelity and secrecy. The candidate remained for a year, with the designation of *picciotto d'onore*, as a pupil under an old Camorrist; and having completed this probation, and given proof of his courage and obedience in circumstances involving danger of life, was advanced to the rank of a *picciotto di sgarro*. Finally, after a longer period, in which he had given proof of his fitness on a number of occasions, he was admitted to full membership of the society as a Camorrist. The members were held under the strictest discipline. Disobedience was punished by flogging, suspension from employment, or expulsion; treachery, by death. If two Camorristi quarreled, their chief decided the question between them; but in difficult cases a duel with daggers was the mode of decision. Under Ferdinand II the Camorra was tolerated for political reasons. The government of Francis II endeavored to put down the society, and the police received instructions to seize and transport all known members of it.

Those who remained entered into alliance with the Garibaldi Committee and rendered essential service in the expulsion of the Bourbons. When the Neapolitan and Sicilian influence became strong in the politics of the new Italy (see ITALY), the government attempted to use the Camorra in its struggle with brigandage, and thus strengthened the influence of the society by making it a political force, as it had often been under the Bourbons. For a number of years the Camorra tended to assume more of the nature of a political machine, manipulated for the purpose of plunder. For a time the society was in full control of the municipal government of Naples and included among its members the heads of the chief departments and practically the entire body of city employees. The association put up offices for sale, guaranteed officials immunity in the pursuit of peaceful speculation, and, in the last extreme, defended them in the courts. Conditions finally became so scandalous as to warrant (1899) the intervention of the Italian government. Municipal government in Naples was suspended, while a royal commission was appointed to investigate the operations of the Camorra. The revelations of the commission led to the formation of an Honest Government League, which succeeded in completely defeating the candidates of the Camorra in the municipal elections of 1901. Defeated in political life, the Camorra turned again to its private character of an organization of the strong and idle living on the weak through a process of extortion, blackmail, and robbery. In 1906 the society came into great prominence again through the murder of Gennaro Cuocolo and his wife. The crime was fastened upon the Camorra through the confession of one of its members. To secure a fair trial the case was transferred from Naples to Viterbo and, after 17 months' hearing by jury, on July 8, 1912, over 30 of the leading Camorristi were convicted and eight men were sentenced to prison on 30-year terms and 18 others for terms ranging from five to nine years. The existence of the Camorra is bound up with the economic conditions of Italy. Sanitary measures and improved educational facilities offer the best method of stamping out this plague of modern Italy. Consult: Ernest Serao, "The Truth about the Camorra," *Outlook*, vol. xcviii; Pasquale Villari, *Lettere Meridionali*; Monnier, *La Camorra* (Florence, 1863); Heckethorn, *The Secret Societies of All Ages and Countries* (New York, 1897); Umiltà, *Camorra et Mafia* (Neuchâtel, 1878); Blasio, *Usi e costumi dei camorriste* (Naples, 1897).

CAMOUFLET, kâ'mô's'flê'. A small (military) mine which does not break the surface when exploded. It is sometimes used to demolish the enemy's galleries. See MINES AND MINING, MILITARY.

CAMP (Lat., campus, a field), **MILITARY.** A collection of tents or huts for the shelter of troops, in a position, or on a piece of ground, specially adapted or prepared for such occupation. When troops are sheltered under canvas, they are in *camp*. When resting on the ground without shelter, they are in *bivouac*. When occupying buildings in towns or villages, or huts specially erected, they are in *cantonment*. Cantonments often develop through improvements of camps, huts or temporary buildings taking the place of worn-out tents. The evolution of the modern camp, or military encampment, is practically the history of modern

armies, strategy, engineering, and sanitation. Of ancient camps the Romans give us the best example. The advance party consisted of a tribune and several centurions, whose duty it was to select a suitable site for the camp, marking out, first of all, a spot for the prætorium, or general's tent, round which, as a centre of the whole system, the rest of the camp was marked out. The camp streets were broad, measuring from 50 to 100 feet, and allowance was always made for the *forum*, or public market place. Polybius (in the second century B.C.) is authority for the full details of the Roman camp system. With regard to their general description, he states that the best conception which can be formed of a Roman camp of the more permanent kind is by regarding it as a military town. According to the same authority the Greeks trusted mainly to the judicious selection of their ground and regarded the natural advantages which they thus secured as supplying in a great measure the means of artificial defense. The Greeks, consequently, did not use the regulation type of camp so rigorously adhered to by the Romans. The Roman plan seems to have been the one most generally adopted through the Middle Ages, with such additions as new arms, new formations, and new branches necessitated. Modern camps, in home countries or possessions, are chosen for their particular local advantage and sanitation, the general health of the troops being the first consideration. In time of war, or when campaigning in an enemy's country, there must be added precautions against attack, locating the camp in a place giving every possible natural advantage. Care is taken that there are no commanding positions within range where an enemy's artillery could be effective; that it is capable of defense; that it is roomy and safe enough to assemble the troops or get under way without hindrance or confusion; and that there are water facilities for man and beast. These and such other rules as circumstances may dictate establish general principles for the selection of camp sites throughout armies of the civilized world. In the United States army camps are organized according to directions given in the regulations. See ENCAMPMENT; BIVOUAC; CANTONMENTS; BILLETING.

CAMP, KĀN, MAXIME DU. See DU CAMP, MAXIME.

CAMP, WALTER (1859-1925). An American athletic expert and author, born in New Haven, Conn. He graduated in 1880 from Yale University, where thereafter he was active in the management of athletics, giving especial attention to football. On this sport he became a leading American authority, and was in demand on various committees which undertook the revision of football rules and brought about the present system of play. He became a member of the Yale University Council. His writings include: *Drives and Puts*, with Lillian Brooks (1899); *The Substitute* (1908); *Jack Hall of Yale* (1909); *Old Ryerson* (1911); *Danny Fists* (1913)—all stories; *Football* (1886); *American Football* (1891, 1896); *Book of College Sports* (1893); *The Book of Football* (1910); *Football for the Spectator* (1911). He also acted as editor of the *Library of Young People*, and contributed on sporting subjects to leading magazines.

CAMPA, KĀM/pā. See ANTI.

CAMPAGNA, KĀM-pā'nyā, GEROLAMO (c.1550-
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c.1626). A Venetian sculptor and architect of the Renaissance. He was born in Verona and there studied under Cattaneo, with whom he removed to Venice. His earliest-known work is the statue of Doge Leonardo Loredan on the tomb in Santi Giovanni e Paolo, Venice, after the designs of his master, whose reliefs in the famous chapel of Sant' Antonio, in the Santo, Padua, he likewise completed. He also carved the decorations of the high altar and the rich tabernacle in the choir of the Santo, the architectural features of which were designed by Cesare Franco. He then returned to Venice, where the remainder of his life was spent, and where his principal works are to be found. Among them are: the statue of "St. Justina" over the portal of the Arsenal; the altar of the Cappella della Rosario (SS. Giovanni e Paolo), which he designed, and in particular the statues of SS. Rose and Thomas Aquinas upon it; the high altar and other works in San Giorgio Maggiore (in which he was assisted by his brother Giuseppe); and the statue of St. Anthony in San Giacomo di Rialto, which is considered his chef d'œuvre. The statue of Duke Federico Montefeltro in the ducal palace, Urbino, and two bronze statues for the fine façade of the Palazzo del Consiglio, Verona, are also important works. Although Campagna was not free from the mannerisms of his age, he possessed technical ability of a high order, and great skill in the treatment of the nude and in decorative effects.

CAMPAGNA DI ROMA, KĀM-pā'nyā dé rō'mā (It., plain of Rome). An undulating, uncultivated, and unhealthy plain of Italy surrounding Rome, including the greater part of ancient Latium. Applying the name in a broad sense to the district extending from Cape Linaro, south of Civitā Vecchia, to Terracina, beyond the Pontine Marshes, we find that its length is about 90 miles; its breadth inland, to the Alban and the Sabine hills, ranges from 25 to 40 miles. A broad strip of sandy plain skirts the Mediterranean. The ground, which never rises higher than 200 feet above the sea, is almost entirely volcanic; the lakes represent craters of extinct volcanoes. The vapors rising from this district, and especially from the Solfatara (q.v.), produce the pestilential atmosphere styled *aria cattiva*. In autumn herdsman descend from the Apennines to the Campagna di Roma with their herds, the pasture in some parts being rich and abundant. Until the fifth and the sixth centuries A.D. the Campagna di Roma was well inhabited, though not very healthful. In the last century of the Roman Republic and under the emperors, it was filled with the luxurious villas of wealthy Romans. The insecurity of the region during the Middle Ages and the failure of the water supply led to its gradual depopulation and the increase of the malignant conditions. During recent years improved drainage, the planting of eucalyptus trees, and other works undertaken by the government have done much to make the Campagna di Roma more healthful and to lead to its gradual reclamation.

CAMPAGNOLA, KĀM-pā'nyō'lā, DOMENICO (c.1484-1563). A Paduan painter and engraver. He was born probably in Venice, but passed most of his life in Padua. He seems to have studied with his brother Giulio, and may have assisted Titian when the latter decorated the Scuola del Santo in Padua (1511); but his own frescoes there are of somewhat later date. Other

pictures of his early period are the "Birth of Christ" (Academy, Vienna), "Holy Family" (Pitti, Florence), "Four Prophets" (Academy, Venice); to a later period belong the three frescoes in the Scuola del Carmine, Padua, and a "Madonna" in the Museo Civico, Padua. Among his engravings are the "Descent of the Holy Spirit" and many woodcuts, one of the best known being the "Massacre of the Innocents." Some of these he even cut himself. He was probably the first artist to make a profession of drawing, as distinct from painting and engraving. Many of his numerous pen-and-ink drawings are in the Uffizi, the British Museum, and the Berlin Cabinet of Engravings. They resemble Titian's, and have often been attributed to him. Consult the monograph of E. Galichon (Paris, 1864).

CAMPAIGN, kām-pān' (Fr. *campagne*, *campagne*, open country, military operations; ML. *campania*, level stretch of country, from Lat. *campus*, field), MILITARY. A connected series of military operations having a definite purpose and object. It may apply to the whole field of hostilities or to each separate and distinct command, if such command is operating with its own programme. For example, in the Civil War of 1861-65 may be cited General Grant's campaign, General Sherman's campaign, General Lee's campaign; while, on the other hand, under the title of the Egyptian campaign (1882) was embraced every operation of the entire war.

CAMPAIGN, THE. A poem with a Latin version, by Joseph Addison, written at the instance of Lord Godolphin, to celebrate the battle of Blenheim in 1704. The amazing success of the piece was largely due to its happy description of Marlborough as one who "rides the whirlwind and directs the storm." It gained for the author first a commissionership of appeals and then the office of Undersecretary of State.

CAMPAN, kām'pān', JEANNE LOUISE HENRIETTE GENEST (1752-1822). A French author. She was first lady of the bedchamber to Marie Antoinette, and her faithful companion until they were separated at the sacking of the Tuileries, Aug. 10, 1792. She then established a school at Saint-Germain and later won the favor of Napoleon, who made her superintendent of an academy at Ecouen founded by him for the education of daughters and sisters of members of the Legion of Honor. On the abolition of the school in 1814, she retired to Mantes, where she died. She wrote *Mémoires sur la vie privée de Marie Antoinette* (1823); *Journal anecdotique* (1824); a treatise, *De l'éducation*; and some pedagogical essays, *Correspondance inédite avec la reine Hortense* (1835). Consult Jules Flammermont, *Les mémoires de Madame de Campan* (Paris, 1886).

CAMPAÑA, PEDRO. See KEMPENEER, PETER DE.

CAMPANARI, kām'pā-nā'rē, GIUSEPPE (1859-1927). An Italian dramatic barytone, born at Venice. He began his musical career as a 'cellist in the Scala orchestra of Milan, but at the same time he studied singing. In 1884 he joined the Boston Symphony Orchestra as 'cellist, and also appeared occasionally as a concert singer. In 1893 he resigned his position with the orchestra to become a member of the Hinrich's Grand Opera Company, when he immediately became famous through his striking impersonation of the rôle of Tonio in the first American production of *Pagliacci*. In 1895-98 he was a member of the

Metropolitan Opera Company. After that he devoted himself chiefly to concert work, appearing only occasionally in opera.

CAMPANELLA, kām'pā-nē'lā, TOMMASO (1568-1639). An Italian monk and philosopher. He was born in Stilo, Calabria, and studied in Naples and Cosenza. His *Philosophia Sensibus Demonstrata*, which included a defense of Telesius against the scholasticism of the Aristotelians, was published in 1591. He was accused of heresy and of conspiring against the government, and spent 27 years in prison at Naples, during which time he wrote much, one of his works being his famous "City of the Sun," which has been translated into English by T. W. Halliday and published in "Ideal Commonwealths" (Morley's *Universal Library*). He was released through the intervention of Pope Urban VIII, but renewed persecutions compelled him to seek refuge in France, where he remained until his death. He was kindly received by Richelieu and granted a pension of 3000 livres by Louis XIII. He expounded a philosophy many of whose tenets resemble the views of Descartes and Kant. His works, 82 in all and treating of many different subjects, include: *De Sensu Rerum et Magia* (1620); the *Civitas Solis*, mentioned before (printed with his *Philosophia Epilogistica Realis*, 1623), a description of an ideal commonwealth similar in character to that outlined in Plato's *Republic*; and *Atheismus Triumphatus* (1636), which assumes the character of an apologetica. His complete works have been edited by d'Ancona (Turin, 1854). His sonnets were translated by J. A. Symonds, in a volume with those of Michelangelo (1878). For his biography, consult: Baldacchini (Naples, 1840) and Amabile (Naples, 1883-87), as well as Dareste, *Morus et Campanella* (1843).

CAMPANERO, kām'pā-nā'rō (Sp., bellman, from *campana*, bell). The bell bird.

CAMPANERTHAL, kām'pā-nēr'tāl, or **CAMPANERTHAL**, DAS. A work on the immortality of the soul by Jean Paul Richter, which derives its name from the beautiful valley of Campan in the Pyrenees, traversed by the Adour.

CAMPANHA, kām'pā-nyā (Portug., plain). A town of Brazil in the State of Minas Geraes, about 150 miles northwest of Rio de Janeiro (Map: Brazil, H 8). It is situated in a gold-mining region and has several churches, a Latin school, a hospital, theatre, etc., and is renowned for its spring of alkaline-gaseous water called *Agua's Virtuosas*. Pop., nearly 7000.

CAMPANIA (Lat., from Lat. *campus*, plain, Gk. *Καμπανία*, *Kampania*). A district of ancient Italy lying along the Tyrrhenian Sea, bounded on the land side by Latium, Samnium, and Lucania (Map: Italy, J 6). Originally inhabited by people of Oscan race, it was early invaded by the more civilized Greeks, who founded there the cities of Cumæ and Neapolis (Naples). At a later period it came under the Etruscan domination, but the bulk of the population remained Oscan in race and language until Roman times (after 90 B.C.). At Naples, however, Greek was spoken to very late times. Here were the *Campi Phlegreæ* of the Greek and the Latin writers, the modern *Solfatara* or sulphur field near Puteoli (Pozzuoli), and here, near Cumæ, was the Lake of Avernus, the fabled entrance to the lower world. The great plain of Campania was always noted for its wonderful fertility and its charming climate and scenery.

The wines of the Mons Massicus and the Ager Falernus were very famous; so, too, were the olives of Venafrum. The Romans, who overran it as early as 340 B.C., called it *Campania Felix* ('Happy Campania'). They did not, however, succeed in Romanizing the inhabitants until after the time of Sulla. The coast of Campania then became a favorite resort for the wealthy Romans, who built handsome villas at Baia, Puteoli, Misenum, and elsewhere. Cicero had a villa at Pompeii. In his reorganization of Italy Augustus made Campania, with Latium, his first district. The chief ancient towns were Capua, Cumæ, Puteoli, Neapolis, Nola, Pompeii, Nuceria, Teanum, Venafrum, and Salernum. The modern Department of Campania consists of the provinces of Avellino, Benevento, Caserta, Napoli, and Salerno, covering an area of 6200 square miles. Pop., 1901, 3,160,446; 1911, 3,311,990.

CAMPANILE, kām'pā-nē'lā (It., from Mid. Lat. *campana*, a bell). A bell tower (q.v.); especially an isolated bell tower of the Italian type. The earliest examples are circular, dating from the fifth century, at Ravenna, adjoining the basilicas of St. Apollinare Nuovo and St. Apollinare in Classe; but they are exceptional. From the eighth century on, the square plan prevailed with only rare exceptions. In Rome they were always of brick, in strongly marked stories without pilaster strips (St. Giorgio in Velabro, eighth century; Sta. Maria in Cosmedin, St. Alessio, etc.). In north Italy they were sometimes of stone or marble, oftener of brick with vertical pilaster strips, arched cornices, and only small openings except the grouped openings of the top or belfry stage. That of San Gottardo at Milan (twelfth century) is octagonal, of brick with stone corner shafts; it is one of the most elegant examples in Italy. The famous leaning tower at Pisa (1174) (q.v.) is of marble, circular in plan, the most remarkable of Italian leaning towers, and the only one decorated with open arcades at each story. It is, however, a watchtower rather than a bell tower. The very elegant campanile of the cathedral of Siena (thirteenth century) and of St. Zenone at Verona (1139) are of banded white and black marble, like the adjoining churches; so also those of Pistoia and Lucca. The campanile on the Piazza dei Signori at Verona is exceeded in height only by that at Cremona (400 feet); both have octagonal lanterns or top stories. The great campanile of St. Mark's (q.v.) in Venice, a rectangular tower of brick begun in 874, completed 1150, and remodeled 1517, the most conspicuous monument of the city, fell on July 14, 1902, owing partly to defective materials, partly to injudicious repairs; it has been reerected on a strengthened pile foundation, in the form it had presented since 1517. The most beautiful of all Italian campanili is that of the Duomo at Florence, designed by Giotto (1335) and completed by Gaddi and Talenti. It is about 300 feet high, incrustated with panels of colored marble; its details of incrustation, inlay, relief, sculpture, and tracery are unsurpassed in Italy. Like most of the Italian towers, it has a nearly flat roof. The Renaissance produced a few campanili of great beauty, especially in Venetia; of these the finest is that of San Giorgio Maggiore by Palladio and Scamozzi, of brick with a marble superstructure and low spire. Of more formal classic design is that of the Capitol (Campidoglio) at Rome. The magnificent Victoria Tower of the Westminster Houses of Parliament

by Barry, though not wholly isolated from the building, may be properly termed a campanile; so also the great tower of the Sacré Cœur Church in Montmartre (Paris) and the memorial tower erected in the campus of Brown University, Providence, R. I.

CAMPANINI, kām'pā-nē'nē, CLEOFONTE (1860-1919). An Italian conductor and operatic manager. He was born at Parma and received his musical education under Bazzini at the conservatory of his native town. In 1883 he began his career as conductor of the Parma Opera. Through the influence of his brother, the famous tenor, Italo Campanini, the young man was engaged as assistant conductor to Vianesi for the first season of Italian opera at the New Metropolitan Opera House in 1883. After his return to Italy he occupied the conductor's chair at Naples, Venice, and Rome. In 1887 he conducted in New York the first American performance of Verdi's *Otello*. In 1903-06 he was conductor at La Scala in Milan. When in 1906 Oscar Hammerstein opened his Manhattan Opera House, he chose Campanini not only as conductor, but as general artistic director. Here he had a splendid opportunity for the full development of his rare gifts, so that even at the end of his first season the new institution was regarded as a dangerous rival of the Metropolitan Company. During the three years of his directorship, 1906-09, Campanini produced eight novelties. When in 1910 the Chicago Opera Company was organized, Mr. Dippel engaged Campanini as general artistic director with practically autocratic power. Upon the retirement of Mr. Dippel in 1913, Campanini succeeded him as general manager. As a conductor Campanini occupies a foremost position among the world's greatest conductors, not only because of his dominating personality, but principally because of the catholicity of his taste. He is perfectly at home in the music of all schools and all nationalities.

CAMPANINI, kām'pā-nē'nē, ITALO (1845-96). An Italian tenor, born in Parma. He enlisted in the army of Garibaldi when 14 years of age and took part in the fight before Milazzo. Having discovered during the campaign that he had a fine voice, he studied singing in Parma, and made his first appearance as the notary in *La Sonnambula* in his native town. He sang with indifferent success in various opera companies until 1869. In that year he went to Milan and placed himself under the tuition of the celebrated Francesco Lamperti. After a thorough training, he made his début in *Faust* at La Scala in Milan, and was pronounced by a critical audience to be one of the finest tenors of the age. In 1872 he made his London début as Gennaro, in *Lucrezia Borgia*, and in 1873 sang with Christine Nilsson in New York. He was heard in the United States during several subsequent seasons and became the most popular operatic tenor of his day in the country. His repertoire included nearly 100 operas and oratorios. In later years, partly owing to an affliction of the throat, his voice failed; but his fine method of producing it and his intelligent singing and acting kept him high in popular favor until a few years before his death. He died in Vigatto, near Parma.

CAMPANULA (ML., dim. from Late Lat. *campana*, bell). A genus of plants of the family Campanulaceæ, distinguished by a bell-shaped corolla with five broad segments. The species number nearly 300, and they are found mostly

in the higher latitudes of the Northern Hemisphere, at high elevations in temperate regions, and about the Mediterranean Sea. The species are mostly herbaceous and are grouped as annuals, biennials, and perennials. The flowers are blue, violet, or white, and many are cultivated as border plants. The name "bellflower" or "bellwort" is given to many and is sometimes extended to include all the species. One of the most common is the bellflower, *Campanula rotundifolia*, a perennial species indigenous to America, Europe, and Siberia. For illustration, see Plate of CAMELLIA, ETC., and MOUNTAIN PLANTS. The Canterbury bell, *Campanula medium*, is a biennial species frequently cultivated. It will flower the first season if sown early and transplanted. Among annual species in cultivation are *Campanula erinus*, *Campanula macrostyla*, and *Campanula americana*. *Campanula pyramidalis* with blue, lilac, or white flowers, *Campanula glomerata* with pale-blue flowers, and *Campanula muralis* are all worthy of cultivation. Formerly medicinal properties were ascribed to some species, and the name "throatwort" was given to *Campanula trachelium* in England, where it was held valuable in some affections of the throat.

CAMPAN'ULA'CEÆ (Neo-Lat., from ML. *campanula*, little bell), BLUEBELL FAMILY. A family of dicotyledonous plants, the species of which number about 600, embraced in about 35 genera. They are mostly herbaceous, a few only being trees or shrubs, and are characterized by alternate exstipulate leaves and usually by a bitter latex. The inflorescence is usually racemose; the flowers regular, five-parted; and the fruit a capsule or berry. The flowers of most of the species are comparatively large, but in *Phyteuma* and *Jasione* they are small and massed in heads like the Compositæ. The Campanulaceæ are mostly found in the temperate and colder climates of the Northern Hemisphere, and the flowers of many are quite ornamental. The fruits of one member of the family (*Canarina campanula*) which grows in the Canary Islands are edible. The chief genera are *Campanula*, *Phyteuma*, *Jasione*, and *Lobelia*.

CAMPAN'ULA'RIA (Neo-Lat., from ML. *campanula*, little bell). A "bell hydroid" of the siphonophorous family Campanulariidae, common about tide-covered rocks, and characterized by having the "hydroid heads inclosed in a calyx, [and] the medusæ, if free, with gonads on radial canals" (Davenport). These are known as bell hydroids and are numerous, the genus *Obelia* being specially common and well represented on the New England coast. See illustration under ALTERNATION OF GENERATIONS.

CAMPARDON, kām'pār'dōn', EMILÉ (1834-). A French author, born in Paris. He was educated at the Ecole des Chartes, and in 1884 became chief of a department in the national archives. He wrote much and illuminatingly on the history of the seventeenth and more especially the eighteenth century. The following are his principal publications: *Histoire du tribunal révolutionnaire de Paris* (2 vols., 1861); *Marie Antoinette à la conciergerie* (1862); *Madame de Pompadour et la cour de Louis XV* (1867); *Voltaire, documents inédits* (1880); *L'Académie royale de musique au XVIIIe siècle* (1884); and with Boutaric, *Mémoires de Frédéric II* (2 vols., 1866).

CAMPASPE, kām-pās'pē. A river of Victoria, Australia, which rises in the Great Divid-

ing Range and, flowing northward, joins the Murray at Echuca (Map: Victoria, D 4). The plains along its course are well cultivated. Length, about 150 miles.

CAMPAS'PE (Gk. Καμψάση). A mistress of Alexander the Great. Apelles is said to have taken her for the model of his "Venus Anadyomene." (See ANADYOMENE.)

CAMPBELL, kām'b'l, or Scot. pron. kām'l. See ARGYLL, MARQUIS OF.

CAMPBELL, ALEXANDER (1788-1866). An American clergyman, the chief founder of the Disciples of Christ (q.v.). He was born in Ireland and studied one year at the University of Glasgow. He came to the United States in 1809 and ultimately settled in Bethany, Va. At first he associated with the Baptists, but about 1827 he organized the society now known as the Disciples of Christ (q.v.). In 1840 he founded Bethany College (Bethany, W. Va.), and remained its president until his death. He established, in 1823, the *Christian Baptist*, which in 1829 became the *Millennial Harbinger*, and which he continued until 1863. He was an ardent believer in the imminent Second Coming of Christ and actually predicted that it would be in the year 1866. He engaged in many public debates and published no less than 60 volumes, including hymn books and a translation of the New Testament. His most typical doctrinal works were *The Christian System* and *Remission of Sin*. He published *Memoirs of Thomas Campbell* (1861), his father and associate in his work. Consult Richardson, *Memoir of Alexander Campbell* (Cincinnati, 1888), and Grafton, *Alexander Campbell, Leader of the Great Reformation of the Nineteenth Century* (St. Louis, 1897).

CAMPBELL, ALLAN (1815-94). An American civil engineer and railroad president. He was born in Albany, N. Y., and at the age of 21 was chief engineer of a railroad. He built the first railroad ever operated in South America; was prominent in the construction of the Harlem Railroad, the Pacific Railroad, and that from Callao to Lima, Peru, and was president of the Harlem Railroad until succeeded by "Commodore" Vanderbilt. He was appointed commissioner of public works of New York City in 1876, and during 1883 was comptroller of the city. In 1882 he was defeated as nominee of the Republicans and Independents for the office of mayor.

CAMPBELL, LADY ARCHIBALD (JANEY SEVILLA). An English actress and author. She was married to Lord Archibald Campbell in 1869. She played the part of Orlando in *As You Like It* in 1884-85; Shepherd Perigot in the *Faithful Shepherdess* in 1885; the title rôle in *Fair Rosamund* in 1886; and Oberon in *A Midsummer Night's Dream* in 1887. She introduced in Europe the acting of pastoral plays in the open air. In 1889 she set and played Banville's *Le Baiser* as a pastoral; in 1899 she wrote the Scottish ballad play, *Tam Lin*, which she produced at the Theatre Royal in Edinburgh, playing the chief rôle herself. In 1907 she dramatized and played as a monologue at the Edinburgh Berkeley Theatre, Yeats's poem, "Cap and Bells." Besides several articles in periodicals on the drama, she is author of *Rainbow Music*, *Treating of the Philosophy of Harmony in Color Grouping*.

CAMPBELL, BARTLEY (1843-88). An American dramatist. He was born in Allegheny City, Pa., became a journalist, and founded the *Evening Mail* in Pittsburgh (1868). In 1869 he started

a monthly magazine in New Orleans; but the success of his first play, *Through Fire* (1871), induced him to devote himself to dramatic authorship. *My Partner* (1879) was his greatest success. He was for a time manager of the Fourteenth Street Theatre, New York. He became insane in 1886 and died in an asylum.

CAMPBELL, BEATRICE STELLA TANNER (1867–). An English actress, born in London, and married in 1884 to Patrick Campbell, who fell in the South African War in 1900. She was already well known as an amateur before she made her début on the professional stage, at the Alexandra Theatre, Liverpool, in 1888. In March, 1890, she appeared in London at the Adelphi, where she afterward played again in 1891–93, creating several parts. She gained a wide reputation in *The Second Mrs. Tanqueray* (1893) at St. James's Theatre, where also she appeared in *The Masqueraders* (1894). As Kate Cloud in *John-a-Dreams*, produced by Beerbohm Tree at the Haymarket in 1894, she made another success, and again as Agnes in *The Notorious Mrs. Ebbsmith*, at the Garrick (1895). Among her later performances have been those in *Fédora* (1895), *Little Eyolf* (1896), and her notable performances with Forbes-Robertson at the Lyceum in the rôles of Juliet, Ophelia, and Lady Macbeth (1895–98). After this, visiting America several times, she appeared with marked success in *Magda* (1900), *The Joy of Living* (1902), as Mélisande to the Pelleas of Mme. Sarah Bernhardt (1904), in *The Whirlwind* and *The Bondman* (1906), *Hedda Gabler* (1907), *The Thunderbolt* (1908), *Lady Patricia* (1911), *Bella Donna* (1911), Shaw's *Pygmalion* (1914). In 1914 she married George Cornwallis West. Consult: Walkley, *Drama and Life* (London, 1907); Shaw, *Dramatic Opinions* (London, 1907); Archer, *The Theatrical World* (London, 1897).

CAMPBELL, CHARLES (1807–76). An American historian, born in Petersburg, Va. He graduated in 1825 at Princeton, was head of a classical school at Petersburg from 1842 to 1855, and afterward was principal of Anderson Seminary, Petersburg. He contributed to the *Southern Literary Messenger*, edited the *Orderly Book* of Gen. Andrew Lewis for 1776 (1860) and *The Bland Papers* (1840–43; see BLAND, THEODORIC), and wrote *History of the Colony and Ancient Dominion of Virginia* (1859).

CAMPBELL, SIR COLIN, LORD CLYDE (1792–1863). A British field marshal, born in Glasgow, Scotland, Oct. 20, 1792. He was the eldest son of Colin MacIver, a carpenter. His maternal uncle, Col. John Campbell, sent him to school at Gosport, and in 1807 introduced him to the Duke of York for an army commission. The Duke mistook him for a Campbell, and his uncle hushed the boy's half-uttered protest with the remark, "It is a good name to fight under." He was gazetted as Colin Campbell, ensign, in 1808 with a regiment which took part in Sir Arthur Wellesley's expedition to Portugal and later under Sir John Moore in Spain; served in the Walcheren expedition, 1809; and by 1813 attained a captaincy. He fought through the war in the Spanish Peninsula with distinction; took part in the expedition to the United States in 1814; and afterward spent nearly 30 years in garrison duty at various English stations. He served in China in 1842 and was present at the attack on Chusan. He next served in the Punjab, India, commanding the left at the battle of Chillianwallah, then for three years com-

manded in the Peshawur district with uniform success against the hill tribes. He was rewarded with the C.B. and K.C.B., and at the outbreak of the Crimean War in 1854 was appointed commander of the Highland Brigade. He took a prominent part at the battle of the Alma; and with the Ninety-third Highlanders, in the immortalized "thin red line," beat back the Russian cavalry in their attack on Balaklava. His services were rewarded with promotion to the rank of major general; he was created a knight grand cross of the Order of the Bath, and received the cross of the French Legion of Honor and other decorations. He was appointed inspector general of infantry, and in 1857, at 24 hours' notice, started for India to command the forces engaged in quelling the mutiny, which by his energy and judgment was soon utterly subdued, his relief of Lucknow being especially brilliant. A notable characteristic of Campbell's generalship was the care he took of his men, his victories being won with the minimum expenditure of the lives of his soldiers. For his exploits in India, Campbell, in 1858, was raised to the peerage as Baron Clyde, and the East India Company granted him an annuity of £2000. He returned to England in 1860 and in 1862 was made field marshal. He died Aug. 14, 1863, and was buried in Westminster Abbey. Consult: Shadwell, *Life of Colin Campbell* (London, 1881); Burne, *Clyde and Strathmairn* (Oxford, Eng., 1891); Forbes, *Colin Campbell, Lord Clyde* (London, 1895); Oswell, *Sketches of Rulers of India*, vol. i (Oxford, Eng., 1908).

CAMPBELL, COLIN (1848–). A Scottish biblical scholar and Egyptologist. He was born in Campbelltown, Argyllshire, and was educated at Glasgow University, where he studied divinity. Ordained in the Established church of Scotland in 1878, he was minister of St. Mary's Parish, Partick, and after 1882 of the parish of Dundee, and was a favorite preacher of Queen Victoria during her visits to Scotland. He was prominent in the volunteer militia movement and received several volunteer medals. He published: *The First Three Gospels in Greek, in Parallel Columns* (2d ed., 1900); *Critical Studies in St. Luke's Gospel* (1891); *Sen-nofer's Tomb at Thebes* (1908); *Two Theban Queens* (1909); *Two Theban Princesses* (1910); an English version (1909) of Naville's *La religion des anciens égyptiens*; *The Miraculous Birth of King Amon-hotep III* (1912).

CAMPBELL, COLIN H. (1859–1914). A Canadian lawyer and statesman, born at Burlington, Ontario. He was educated at the Oakville high school, was called to the bar in 1881, and removed to Manitoba the following year. He entered municipal politics, serving in the Winnipeg City Council, and in 1893 was the unsuccessful Conservative candidate to represent Winnipeg in the House of Commons. In 1899 he was elected to the Manitoba Legislature, and in 1900 became Attorney-General in the Conservative administration of Sir Rodmond Palen Roblin (q.v.). He was a delegate to the Interprovincial Conferences at Ottawa in 1906 and 1910, and also to the Imperial Conference on Education at London in 1907. In 1905 he introduced in the Manitoba Legislature a resolution for the extension of the boundaries of that province north and west, a change which took place in 1912. (See MANITOBA.) He resigned as Attorney-General in 1911 and in the same year was appointed Minister of Public Works.

CAMPBELL, DOUGLAS (1839-93). An American lawyer and historical writer, born in Otsego Co., N. Y. He graduated at Union College in 1860, studied law at Harvard, served for a time in the Civil War as captain of the 121st New York Volunteers, and was admitted to the New York bar in 1866. After about 20 years of practice he retired, partly on account of ill health, to devote himself exclusively to the study of American history. His book, *The Puritan in Holland, England, and America, an Introduction to American History* (2 vols., New York, 1892; 4th ed., 1902), attempts to prove that the legal and political institutions of the United States were ultimately derived, not from England, but from Holland—directly through the Dutch settlers of New York and indirectly through the English settlers of Plymouth, Mass., who, before coming to America, had spent some years in Amsterdam and Leyden. Though the book displays considerable erudition, its thesis has met with little support among historical scholars. Campbell also published two pamphlets entitled *Historical Fallacies Regarding Colonial New York* (1879) and *The Origin of American Institutions as Illustrated in the History of the Written Ballot* (1891).

CAMPBELL, DOUGLAS HOUGHTON (1859-). An American botanist, born in Detroit, Mich. He graduated at the University of Michigan in 1882 (Ph.D., 1886) and afterward took supplementary courses in Germany. In 1891 he became professor of botany at Leland Stanford Junior University. He published: *Elements of Structural and Systematic Botany* (1890); *Structure and Development of Mosses and Ferns* (1895); *Lectures on the Evolution of Plants* (1899); a *University Text-Book of Botany* (1902); *Plant Life and Evolution* (1911).

CAMPBELL, EDWARD DE MILLE (1863-). An American chemist, born at Detroit, Mich. He was educated at the University of Michigan and became chemist of the Ohio Iron Company in 1886, of the Sharon (Pa.) Iron Company in 1887, and the Dayton (Tenn.) Coal and Iron Company in 1888. In 1890 he was appointed assistant professor, in 1902 professor of chemical engineering and analytical chemistry, and in 1905 director of the chemical laboratory at the University of Michigan.

CAMPBELL, GEORGE (1719-96). A Scottish clergyman, born in Aberdeen. He was educated at Marischal College, studied divinity in Edinburgh and Aberdeen, and was ordained in 1748. He became pastor of a church in Aberdeen (1757), where he and Thomas Reid were fellow members of a philosophical society, principal of Marischal College (1759), and professor of divinity there (1771). His *Dissertation on Miracles* (1762) was a reply to Hume's essay (1748). He also wrote a *Philosophy of Rhetoric* (1776) which is superior to Blair's *Rhetoric*, if not so popular, and a *New Translation of the Gospels* (1778). Consult the biography by Keith prefixed to Campbell's *Lectures on Ecclesiastical History* (London, 1800).

CAMPBELL, SIR GEORGE (1824-92). An English statesman, nephew of John Campbell (1779-1861). He was educated at Edinburgh, St. Andrews, and Haileybury. He entered the Indian Civil Service in 1842; then studied law; and in 1858 was appointed judge of the High Court of Judicature in Calcutta, and in 1867 Chief Commissioner of the Central Provinces of India. The commission for relief

of the Orissa famine (1866), of which he was president, organized an effective method of famine relief. He served several years in Parliament, and in 1871 became Lieutenant Governor of Bengal. In 1874 he was chosen a member of the Council of India. In 1876 he supported Gladstone's Eastern policy. He wrote: *Modern India* (1852); *India as It May Be* (1853); *Handy Book on the Eastern Question* (1876); *White and Black in the United States* (1879); *The British Empire* (1887). Consult his *Memoirs of my Indian Career* (2 vols., London, 1893), edited by Sir Charles Bernard.

CAMPBELL, HELEN STUART (1839-). An American author, born at Lockport, N. Y. She wrote much for children, but her later work includes some fiction and books on social reform. Her publications include: *The Ainslie Series* (4 vols., 1864-77); *Sin Sinners* (1877); *The Easiest Way in Housekeeping and Cooking* (1878); *His Grandmothers* (1878); *The Problem of the Poor* (1879); *Under Green Apple Boughs* (1881); *Mrs. Herndon's Income* (1885); *Prisoners of Poverty* (1888); *Darkness and Daylight* (1891; 3d ed., 1895); *Women Wage Earners* (1893); *Household Economics* (1896; rev. ed., 1907); *Ballantyne* (1901).

CAMPBELL, JAMES EDWIN (1843-). An American Democratic politician. He was born in Middletown, Ohio, studied law, and in 1863 enlisted as a gunner in the navy, serving with the Red River and Mississippi flotillas. He was prosecuting attorney of Butler County in 1873, served in Congress from 1884 to 1889; and in 1889 defeated Joseph B. Foraker for the governorship of Ohio. In 1891 he was defeated by William McKinley and in 1895 by Asa S. Bushnell. He practiced law in New York City.

CAMPBELL, JAMES VALENTINE (1823-90). An American jurist, born in Buffalo, N. Y. He lived in Detroit after 1826, graduated at St. Paul's College (College Point, L. I.) in 1841, and was admitted to the Michigan bar in 1844. Upon the establishment of the Michigan Supreme Court in 1857, he was elected an associate justice. He was a professor in the law school of the University of Michigan from 1859 to 1885 and was prominent in the Republican party and the Episcopal church of Michigan. He wrote valuable *Outlines of the Political History of Michigan* (1876).

CAMPBELL, JOHN (?-1806). A British soldier, born in Strachur, Scotland. He entered the army in 1745 and fought with distinction in the Scottish rebellion (1745) and in Flanders (1747). During the French and Indian War in America he served as captain of the Forty-second Highlanders and was wounded at Ticonderoga (1758). As lieutenant colonel of the Forty-seventh Infantry he again came to America with his regiment in 1776 and was successively appointed major general (1779), colonel of his regiment (1780), and commander of the British forces in West Florida, where he was eventually compelled to surrender Pensacola to the Spaniards, May 9, 1781. He was promoted general in 1797.

CAMPBELL, JOHN (1779-1861). Lord High Chancellor of England. He was born at Cupar, Fifeshire, Scotland, in 1779. He was at first destined for the ministry, and was sent to the University of St. Andrews. Having no inclination for a clerical life, after he had completed his academic studies, at the age of 19, he went

to London and engaged in newspaper work. At the same time he became a student in Lincoln's Inn, where he was a pupil of the distinguished special pleader Samuel Warren, and in 1806 was called to the bar. While waiting for clients he became a court reporter and published four volumes of reports with valuable notes. Notwithstanding his good sense and remarkable industry, professional success at the bar came slowly, probably owing to a certain hardness of disposition and a lack of attractive personal qualities. It was not until 1827 that he was made a King's counsel. From this time on, however, his promotion was rapid. In 1830 he entered Parliament, where his zeal, his capacity for hard work, and his attention to details made him a useful supporter of the Whig party. He devoted himself with characteristic energy and persistency to the amelioration of some of the cumbrous features of the law, and his name is associated with several beneficial statutes. He failed, however, in his favorite project of bringing about a general registry of land titles in England, such as exists in the United States, and this reform still remains to be effected. In 1827 he became the head of the great Real Property Commission, which made a searching inquiry into the real-estate laws of England, and whose reports and recommendations have proved of inestimable value to subsequent generations of law reformers.

Campbell was an ardent supporter of Lord John Russell's first Reform Bill in 1831, was made Solicitor-General in 1832, and two years later was knighted and promoted to the post of Attorney-General. In the same year he was sent to Parliament from Edinburgh. He continued to represent Edinburgh down to 1841, and remained in the office of Attorney-General during that period, with the exception of the short time in 1835 when the Conservatives were in power. In 1841 he was made Chancellor of Ireland and a peer of the United Kingdom with the title of Baron Campbell of St. Andrews, but held office for only a few months, when the Melbourne cabinet left office, necessitating his resignation. For the first time since boyhood he found himself without regular daily labor, and at the mature age of 60 set to work to win that literary fame which he professed always to have secretly coveted. His first publication was a collection of his speeches at the bar and in the House of Commons. For three or four years after the publication of his speeches Campbell was engaged in the preparation of the *Lives of the Chancellors*, the first series of which appeared in 1845. In 1846 he joined the Russell cabinet in the capacity of Chancellor of the Duchy of Lancaster. His ministerial duties were not sufficiently arduous to interrupt his literary labors, and he proceeded to complete the *Lives of the Chancellors* and to publish a supplemental series of *Lives of the Chief Justices of England*. Both works had great popularity, but leave no doubt that the author was more fitted to be a practical lawyer than a man of letters. Though executed in a sprightly manner, these writings are without style and represent the envy, the prejudices, and the want of sympathy which were leading traits of Campbell's character. He returned to more congenial labors in 1850, when he was appointed to succeed Denman as Chief Justice. He held the office for nine years, at the end of which he received the chancellorship of England. He

died in June, 1861. His *Life* has been written by his daughter (1881).

CAMPBELL, JOHN (1840-1904). A Canadian scholar, born in Edinburgh, Scotland. He was educated at the University of Toronto and at New College, Edinburgh, distinguishing himself in both institutions. In 1868 he became minister of the Charles Street Presbyterian Church in Toronto, and in 1873 he was appointed professor of Church history and apologetics in the Presbyterian College, Montreal. He contributed largely to learned societies and to Church reviews, and his work in theology and ethnology has been recognized both in America and in Europe. His chief single publication is *The Hittites: Their Inscriptions and their History* (2 vols., 1890). For certain statements in an address on *The Perfect Father or the Perfect Book*, Professor Campbell was tried for heresy before the Presbytery of Montreal in 1893 and convicted. He, however, appealed to the Synod of Montreal and Ottawa and was sustained.

CAMPBELL, JOHN ARCHIBALD (1811-80). An American jurist. He was born in Washington, Ga.; graduated in 1826 at the University of Georgia, and was admitted to the bar in 1829, before he was of age. He practiced in Alabama and was a member of the Legislature of that State. President Pierce in 1853 appointed him associate justice of the United States Supreme Court. At the outbreak of the Civil War he resigned, although he had opposed secession, became Assistant Secretary of War in the Confederate government, and was one of the peace commissioners at the Fortress Monroe conference in 1865. After the war he was imprisoned at Fort Pulaski, but was released upon parole, and afterward practiced law in New Orleans. He wrote *Reminiscences of the Civil War* (1887).

CAMPBELL, JOHN FRANCIS, of Islay (*Iain Ileach*) (1822-85). A Scottish-Gaelic scholar. He was born in Edinburgh, Dec. 29, 1822, and was the eldest son of Walter Frederick Campbell and Lady Eleanor Charteris, eldest daughter of Francis, seventh Earl of Wemyss. He was educated at Eton and Edinburgh and occupied several minor government posts. He was a meteorologist of some distinction and invented an instrument for recording the intensity of the sun's rays. In 1865 he published *Frost and Fire, Natural Engines, Toolmarks and Chips, with Sketches Taken at Home and Abroad by a Traveler*, and in 1883 a book on *Thermography*. But he is chiefly remembered for his collections of Scottish-Gaelic folk tales and ballads. In 1860-62 he published his *Popular Tales of the West Highlands* in 4 vols., and in 1872 he brought out an important volume of Gaelic ballads under the title *Leabhar na Feinne*. The tales were taken down conscientiously from the mouths of the people and constitute one of the most valuable collections of the sort that have been made in the Celtic countries. The *Leabhar na Feinne* brings together all the accessible Scottish-Gaelic ballads on Ossianic subjects. It was Campbell's intention to publish other volumes containing additional cycles of ballads, but the plan was never carried out. A new edition of his *Celtic Dragon Myth* was published in 1911 (Edinburgh).

CAMPBELL, JOHN McLEOD (1800-72). A Scottish theologian. He was born at Kilninver and studied in Edinburgh and Glasgow from 1811 to 1821, when he was licensed. He was inducted into the parish of Row in 1825, was

tried for heresy in his doctrines regarding the Atonement, and was deposed in 1831. From 1833 to 1859 he preached to an independent congregation in Glasgow. His chief work is the *Nature of the Atonement* (1856; 4th ed., 1873), one of the most important works in English on the subject, in which he substituted for the legal and penal theory of the Atonement the explanation of "vicarious repentance"—that Christ identified himself with the sinner through perfect sympathy and brotherhood and thus offered an "equivalent repentance." Consult his *Reminiscences* (London, 1873) and the *Memorials* (ib., 1877), both edited by his son.

CAMPBELL, LEWIS (1830-1908). A Scottish Hellenist, born in Edinburgh and educated at the Edinburgh Academy and the universities of Glasgow and Oxford. He was fellow and tutor of Queen's College, Oxford (1855-58); vicar of Milford, Hampshire, for five years; professor of Greek at the University of St. Andrews (1863-94); and honorary fellow of Balliol College, Oxford (1894). One of the foremost British Platonists, he ranked with Adam and with Jowett, his friend at Oxford; and in Greek tragedy, especially Sophocles, Jebb alone of his British contemporaries ranked with him. Campbell edited (1904) a selection from Thomas Campbell, his father's cousin, in the *Golden Treasury Series*. Among his publications are: An edition of Sophocles (2d ed., 1879), Plato's *Sophistes and Politicus* (1867), the *Theætetus* (2d ed., 1883), and, with Jowett, the *Republic* (1894); *Life and Letters of Jowett* (1897, with E. A. Abbott) and *Letters of Jowett* (1899); a *Life* (with W. Garnett, 1882; new ed., 1884) of James Clerk Maxwell, the physicist, a schoolmate and friend; *A Guide to Greek Tragedy for English Readers* (1891); *Religion in Greek Literature* (1898); versions in verse of Æschylus (1890) and Sophocles (1883); *Tragic Drama in Æschylus, Sophocles, and Shakespeare* (1904); and *Paralipomena Sophoclea* (1907).

CAMPBELL, REGINALD JOHN (1867-). A British Congregational minister, born in London of Scottish-Ulster stock. He was educated at University College, Nottingham, and in Belfast, and taught at Ashton, Cheshire. Later (1895) he graduated from Christ Church, Oxford, with honors in modern history. For several years he preached in the Union Street Church (Congregational), Brighton, in 1903 succeeding Joseph Parker as minister of the London City Temple. One of the most prominent and magnetic of English Nonconformist preachers and thinkers, and an ardent Imperialist, he published in 1907 *The New Theology*, and in 1908 *Christianity and the Social Order*. His *New Theology*, a popular book putting ethics above dogma, was attacked by P. T. Forsyth and other Congregationalists, but it occasioned no actual schism.

CAMPBELL, THOMAS (1777-1844). An English poet, born in Glasgow, July 27, 1777. He was educated at the University of Glasgow, where he was distinguished for his knowledge of Greek literature. In 1795 he went as tutor on the island of Mull. The scenery of the western Highlands, which made a deep impression on his mind, is reflected in his verse. Returning from Mull, he repaired to Edinburgh with the intention of studying law. This plan, however, he soon abandoned for literature. His first poem, *The Pleasures of Hope*, suggested to him while at Mull, was published in 1799, and

went through four editions in a twelvemonth. After its publication Campbell went to Germany, visiting Munich, Leipzig, and Hamburg, where he was staying at the time of the battle of Hohenlinden. During this period he wrote *The Exile of Erin and Ye Mariners of England*. Returning to Edinburgh, he published, in 1801, *Lochiel's Warning and Hohenlinden*. In 1803 he proceeded to London and adopted literature as a profession. In 1805, through the influence of Fox, he was granted a royal pension of £200 a year. It was in 1805, too, that his *Poems* appeared. In 1809 appeared *Gertrude of Wyoming*, which bears the same relation to *The Pleasures of Hope* that Thomson's *Castle of Indolence* bears to *The Seasons*—a less brilliant and striking, but more mature and finished performance. In 1819 he published his *Specimens of British Poets*, containing an excellent introductory essay on poetry and good biographies of the poets themselves. At this very time he was also delivering lectures on poetry. After this he edited the *New Monthly Magazine*, contributing to it several poems, among which is *The Last Man*. In 1824 he published *Theodoric and Other Poems*. In 1826 he was elected lord rector of the University of Glasgow and received the unusual honor of reflection in the two following years. He published *The Pilgrim of Glencoe and Other Poems* in 1842. His later publications added nothing to his fame. He died in Boulogne, France, June 15, 1844, and was buried in Westminster Abbey. His lasting fame rests on *Hohenlinden* and the patriotic lyrics *Ye Mariners of England* and *The Battle of the Baltic*, all of which are stirring and abound in lines that now belong to the literature of quotation. Consult: Beattie, *Life and Letters of Thomas Campbell* (London, 1849); Redding, *Literary Reminiscences of Campbell* (London, 1860); *Poetical Works*, ed. by Hill, with *Life* by Allingham (London, 1891); *Complete Works of Thomas Campbell* (Oxford Edition, 1908).

CAMPBELL, WILLIAM (1745-81). An American soldier, born in Augusta (then Orange) Co., Va. In 1767 he removed to the Holston valley, and in 1773 became one of the first justices of the peace in Fincastle County. He served under Colonel Christian in Lord Dunmore's War (q.v.) in 1774, joined Patrick Henry's Virginia forces in 1775, and in July, 1776, assisted in forcing Governor Dunmore from Gwynn's Island. In the same year he married a sister of Patrick Henry. He became lieutenant colonel of the newly organized Washington County in 1777. He served in the Virginia House of Delegates in 1780, but, obtaining a leave of absence in June, took an active part in numerous contests with the Tories, and in the famous battle of King's Mountain (q.v.) on October 7 was one of the American leaders. Early in 1781 he joined General Greene, and on March 15 took a conspicuous part in the battle of Guilford Courthouse (q.v.); but resenting the failure of Colonel Lee, commanding the cavalry, to come to his aid at a critical moment in this action, he withdrew in disgust from the service. He then again became a member of the House of Delegates, but in June was appointed brigadier general of militia and served under Lafayette until his death in August. His service was highly prized by Washington and Lafayette. Consult a sketch by E. D. Warfield in *Magazine of Western History*, January, 1887.

CAMPBELL, WILLIAM, LORD (?-1778). The

last English Governor of South Carolina, the youngest son of the fourth Duke of Argyll. He became a captain in the British navy in 1762; was a member of Parliament in 1764, was Governor of Nova Scotia from 1766 to 1773, and in 1775 became Governor of the Province of South Carolina. Here, on the outbreak of the Revolution, he was nearly successful in his attempts to keep the Colony loyal. He was trapped into divulging information of plans for conquering the Colonies by arms and had to take refuge on a British man-of-war. In 1776, during the British attack upon Fort Moultrie, he received a wound while aboard Sir Peter Parker's flagship, which afterward resulted in his death. Consult McCrady, *The History of South Carolina in the Revolution*, vol. i (1901).

CAMPBELL, WILLIAM WALLACE (1862-). An American astronomer, born in Hancock Co., Ohio. After graduating from the University of Michigan he was professor of mathematics at the University of Colorado in 1886-88, and instructor in astronomy at the former institution in 1888-91. He became astronomer in 1891 and director in 1901 of the Lick Observatory, and also had charge of eclipse expeditions to India, Georgia, Spain, and Flint Island. He received several medals in recognition of his work, including the Janssen prize of the Paris Academy of Sciences in 1910. Besides many papers on the motion of solar eclipses, stars, on comet orbits, and on the spectra of nebulae, comets, and stars, he is the author of *The Elements of Practical Astronomy* (1899), *The Return of Halley's Comet* (1909), and *Stellar Motions* (1913).

CAMPBELL, WILLIAM WILFRED (1861-). A Canadian poet, born in Berlin, West Ontario. Educated in Toronto and in Cambridge, Mass., Campbell was ordained to the Episcopal ministry (1885), and after some experience in a New England parish he became rector of a church in St. Stephen, New Brunswick (1888). In 1891 he removed to Ottawa, where he obtained a place in the civil service. In 1899 Campbell won attention by his fresh and musical *Lake Lyrics and Other Poems. The Dread Voyage* (1893) and *Beyond the Hills of Dreams* (1899) contain several impassioned poems on patriotic and Imperial themes. *Mordred and Hildebrand*, literary dramas, were published together in 1895. Among his other works are: *Collected Verse* (1906); *Canada* (1907), in collaboration with the artist, T. M. Martin, a work descriptive of the Dominion; the historical novel, *A Beautiful Rebel* (1909); *The Scotsman in Canada* (1911); and *The Oxford Book of Canadian Verse* (1914). See CANADIAN LITERATURE.

CAMPBELL-BANNERMAN, SIR HENRY (1836-1908). A British statesman born at Stracathro, Forfarshire, Scotland, Sept. 7, 1836. He was the younger son of Sir James Campbell and assumed his additional surname under the will of a maternal uncle. He studied at Glasgow and Cambridge universities, was elected in 1868 to Parliament for Stirling, and was repeatedly reelected. In 1871-74 and again in 1880-82 he was Financial Secretary to the War Office; in 1882-84 Secretary to the Admiralty; in 1884-85 Chief Secretary for Ireland; in 1886 and 1892-95 Secretary for War. In December, 1898, he was chosen leader of the Liberal party in succession to Sir William Vernon Harcourt. Without displaying the preëminent abilities of his predecessors, Gladstone or Harcourt, he brought to the

difficult post of leader of a weak minority the qualities of patience, courage, persistence, and common-sense moderation. On the resignation of the Balfour cabinet in December, 1905, the King sent for the Liberal leader, and the new ministry was announced on December 11. Contrary to expectation, the Premier, who chose to act as First Lord of the Treasury, succeeded in gathering about himself a ministry of exceptional talent, representing all shades of Liberal opinions and including for the first time in parliamentary history a representative of labor in the person of Mr. John Burns. The Premier avoided the tactical error of attempting to rule without a majority and dissolved Parliament. The election resulted in an unprecedented triumph for the Liberals. Sir Henry's health failed in 1907, and he was obliged to resign the leadership on April 5, 1908, and died on the 22d. Consult McCarthy, *Sir Henry Campbell-Bannerman* (New York, 1903), and Channing, "Sir Henry Campbell-Bannerman," in the *Fortnightly Review*, vol. lxxxix (London, 1908). See GREAT BRITAIN.

CAMPBELLFORD. A town in Northumberland Co., Ontario, Canada, situated on the Grand Trunk Railway, 20 miles north of Brighton (Map: Ontario, G 5). It has excellent water power, which is utilized in the manufacturing industries. There are paper, woolen, pulp, saw, flour, and planing mills; also foundries, bridge works, a shoe factory, and a tannery. Pop., 1901, 2485; 1911, 3051.

CAMPBELL ISLANDS. A lonely group in the South Pacific, in lat. 52° 33' S. and long. 169° 8' E. (Map World: Western Hemisphere, P 1). Though they are mountainous and measure only 30 miles in circumference, they are valuable on account of their harbors. They belong to New Zealand, and are used as provision depots, but are not permanently inhabited. They are scientifically interesting, being volcanic and displaying a rich and varied flora.

CAMPBELLITES, THE. 1. A religious denomination founded in the United States by the Rev. Alexander Campbell. Once called the New Lights, they are still variously known as the Christian Church, the Church of Christ, and even the Reformers, though the name preferred by them is Disciples of Christ (q.v.). 2. The followers of the Rev. John McLeod Campbell, who in 1831, because of difference of faith about the Atonement, left the Church of Scotland.

CAMPBELL'S (LORD) ACT. The English statute which created the cause of action for the negligent killing of a person. Prior to the enactment of this statute by Parliament in 1846 (9 and 10 Vict. c. 93), while a person injured through the negligence or default of another was entitled to maintain an action for damages against the person responsible for the injury, there was no redress if the accident resulted in the death of the person injured. This was due to the principle of the common law that such an injury was a purely personal matter, giving a right of redress only to the person injured, and that consequently the right of action died with the person. The fact that the death of a person might involve the loss of support or other financial loss to those whom he left behind did not, under the influence of this conception, afford a right of action to those by whom the loss was suffered. It was in order to remedy this grave defect in the common law that Lord Campbell, then a member of the British government, introduced and secured the

passage of the measure that bears his name. By its terms the wife, husband, parent, or child of a person whose death has been caused by the "wrongful act, neglect, or default" of another may maintain an action and recover damages in respect thereof. The principle of Lord Campbell's Act has been everywhere recognized in the United States, and similar legislation has been enacted in all the States and by the national Congress. See **DEATH**; **NEGLIGENCE**; **TORT**; and the authorities referred to under those titles.

CAMPBELLTON. A town in Restigouche Co., New Brunswick, Canada, situated on Bay Chaleur, and on the International of New Brunswick and the Intercolonial railways, 12 miles southwest of Dalhousie and 140 miles north of Fredericton (Map: New Brunswick, C 1). It has lumbering and fishing industries and contains lumber and shingle mills, sash, woodworking, and door factories. Pop., 1901, 2652; 1911, 3817.

CAMPBELTOWN. A royal burgh and seaport on the east coast of the peninsula of Kintyre, in Argyllshire, Scotland, 65 miles west-southwest of Glasgow, on a fine harbor or sea-loch (Map: Scotland, C 4). A sculptured granite cross stands in the principal street and is supposed to have been brought from Iona. The town is famous for its whisky distilleries and imports large quantities of barley. Coal is found in the vicinity. Its fisheries are important. Campbeltown is a favorite summer resort. Pop. of civil parish, 1901, 10,236; 1911, 9,497.

CAMP BIRD, or **ROBBER.** The Canada jay. See **JAY**.

CAMPE, kām'pē, JOACHIM HEINRICH (1746-1818). A German teacher, lexicographer, and writer for children. He studied theology in Halle and became a warm partisan of the educational reforms of Basedow (q.v.), whose place he took during the year 1777 as the head of the Philanthropium in Dessau. On account of trouble with Basedow he left Dessau and opened schools near Hamburg and then in Holstein. Called to Brunswick by the Duke, he tried to reorganize the school system according to his theories, but failed on account of trouble with the church and the government. A little later he devoted himself to the writing of educational works and also built up a prosperous business as a publisher of pedagogical works. In 1789 he visited Paris and became an ardent advocate of the principles of the Revolution. His juveniles, all written for the purpose of instruction, comprise 37 vols. His *Robinson Crusoe der Jüngere* ('Robinson Crusoe the Younger') has been translated into many languages. He also published some lexicographical works. Consult Leyser, *Joachim Heinrich Campe* (2 vols., 2d ed., 1896).

CAMPEADOR, kām'pā-ā-dōr'. An epithet used of warriors. In particular, a title of the Cid (q.v.).

CAMPECHE, Mex. pron. kām-pā'chā. One of the Atlantic states of Mexico, occupying the south part of the peninsula of Yucatan and bordering on Guatemala and the Gulf of Campeche (Map: Mexico, O 8). Its area is 18,087 square miles. The soil is for the most part sandy and unproductive, but there are good pasture lands in the north and large, heavily forested districts in the south. The main products are rice, sugar, salt, tobacco, mahogany, cedar, hides, and logwood, from which last product (*palo de campeche*) both the state and its capital derive their name. Pop., 1879, 90,413; 1900, 86,542.

The Indians form a considerable portion of the population.

CAMPE/CHE, or **CAMPEA/CHY**. The capital of the Mexican state of the same name and a fortified seaport town, situated on the Gulf of Campeche, in the Gulf of Mexico, at the mouth of the San Francisco River (Map: Mexico, O 8). Under the Spanish régime Campeche was one of the three open ports of this coast, and its general appearance still gives evidence of its former wealth and importance. Founded in 1540 on the site of a native village, of which there are interesting remains still extant, the city has witnessed many important events, down through the revolution of 1842. To-day the industries of Campeche are unimportant, with the exception of shipbuilding, but it is the centre of the trade in Campeche wood and also in wax. Its harbor is sheltered by a breakwater, but is too shallow for vessels of deep draft. The town has a college. Pop., 1900, 17,109.

CAMPEGGIO, kām-pēj'ō, or **CAMPEGGI**, kām-pēj'ē, LORENZO (1474-1539). An Italian prelate. In early life he was a lawyer, but after losing his wife he became an ecclesiastic and rapidly rose to the position of Cardinal. In 1518 he was sent to England to preach a crusade against the Turks, but was unsuccessful. Henry VIII made him Bishop of Salisbury in 1524, and he came again to England in 1528 to assist Wolsey in the case of Henry's divorce from Catharine. His efforts to bring about a reconciliation came to nothing, however, and the see of Salisbury was taken from him. At Nuremberg, in 1524, Campeggio tried to win back Luther to the Catholic church. At the Diet of Augsburg, in 1530, he advised Charles V to adopt a relentless policy towards the Protestants of Germany. He became Cardinal Bishop of Sabina in 1537, and died two years later in Rome.

CAMP EQUIPAGE. Articles and materials necessary for the proper equipment of a camp. It includes, among other things, tents, furniture, fittings, cooking utensils, and articles of common use. The description and quantity of camp equipage will depend on the purpose and location of the camp, its permanent or temporary character, and the number of troops accommodated. See **ENCAMPMENT** **FIELD COOKING**.

CAMPER, kām'pēr, PIETER (1722-89). A Dutch anatomist and naturalist. He was born in Leyden and studied medicine there, graduating in 1746 in medicine and philosophy. In 1750 he became professor in Franeker, in 1755 in the Athenæum at Amsterdam, and in 1763 in Groningen, where he remained until 1773. On being elected a member of the State Council in 1789, he removed to The Hague, where he died. He was distinguished for the services he rendered both to human and comparative anatomy, to surgery, obstetrics, and medical jurisprudence, and was a skillful draftsman. His collected writings, with plates, appeared under the title *Œuvres qui ont pour objet l'histoire naturelle, la physiologie et l'anatomie comparée* (3 vols., Paris, 1803). For his observations on the facial angle, see **ANGLE**.

CAMPERDOWN (Dutch, *Camperduin*, Downs of Kamp). A broad tract of low downs which borders the North Sea on the west side of the peninsula which separates it from the Zuider Zee (Map: Netherlands, C 2). It takes its name from the neighboring hamlet of Kamp, about 25 miles north of Haarlem. It gives its

name to the victory obtained off that part of the coast by the British Admiral Duncan over the Dutch fleet Oct. 11, 1797.

CAMPERIO, kām'pā-rē'ò, MANFREDO (1826-99). An Italian traveler, born in Milan. He traveled in Turkey, Australia, and the Sunda Islands; upon the opening of the Suez Canal explored the Nile as far as Assuan; went thence to the East Indies, Ceylon, and Java; and, in the service of the Society for the Commercial Exploration of Africa, which he founded, traveled through Tunis, Tripoli, and Bengasi. He established, in 1876, the review *Esploratore*. He wrote on commercial geography and colonization.

CAMPERO, kām-pā'rò, NARCISO (1815-96). A Bolivian soldier and politician, President of Bolivia from 1880 to 1884, born at Tojo (now in Argentina). He became a brigadier general in 1871 in the Bolivian army and for a brief period in 1872 was Minister of War. He was Minister in London. Upon the overthrow of Daza by a revolution in La Paz, he was proclaimed President on April 9, 1880. He assumed command of the combined armies of Bolivia and Peru, but on May 26, 1880, was routed at Tacna. His administration, a tranquil one so far as concerned internal affairs, came to an end on Aug. 1, 1884, when he retired to private life.

CAMP-FIRE GIRLS. An organization founded in 1912 for promoting good health by outdoor life, encouraging economy, and effecting social improvements. Camping out is a regular feature of the annual programme. The organization rapidly increased and by 1922 the members numbered over 150,000. Courses in Camp-Fire work were being given in several normal colleges.

CAMP-FIRE CLUB OF AMERICA, THE. An organization (incorporated in New York in 1904) largely social in its character, but expressly devoted to the preservation of forests and the protection of wild animals, birds, and fish. Its Code of Ethics, declares against the sale of wild game for food and the killing of all female hoofed animals; and urges extreme conservatism in the killing of all kinds of game and strict observance of all legislation calculated to protect and increase the supply of game. Accordingly, the club actively supported the legislation for the preservation of the fur seal (q.v.); the Bayne bill prohibiting the sale of native wild game in New York (which became a law in 1911); the McLean bill, placing all migratory birds under the protection of the Federal government (passed in 1913); the Hornaday law (a clause in the Tariff Law of 1913), which prohibits the importation into the United States of wild birds' plumage for millinery purposes; and other national and State measures for the preservation of wild life and the forests. The club's headquarters are in New York City, and in 1913 its membership numbered 460, including many of the best known of American sportsmen, as well as painters and sculptors of mammals and birds, and writers about outdoor life.

CAMP FOLLOWERS. Sutlers, servants, dealers in small wares, and sometimes natives of the vicinity, who travel with, or follow in the train of, an army on the march. They are invariably a source of trouble and responsibility to the commander of the army to which they attach themselves and are often a source of danger.

They are not so much in evidence in modern campaigns as in the past, unless the campaign is being conducted in a wild or uncivilized coun-

try. Formerly, owing to the absence of railroads and steamships, armies had frequently to undertake long marches, with practically no base of supplies, or at the best having very meagre communication with such base, rendering necessary the carrying of great quantities of stores and supplies. Natives were employed for this work, and in instances where the roads were to be constructed or were in need of repairs, would also be used for that purpose. It has been stated that in February, 1839, when a Bengal army of 15,000 men left Shikapur for Afghanistan, it was accompanied by at least 85,000 camp followers. In European countries, and in modern times, the presence of railroads obviates a certain amount of marching, and in conjunction with steamships keeps the army well supplied, rendering any large number of camp followers unnecessary. Those who do exist, however, are provided for in regulations, are subject to the articles of war, and are under the control of the commanding officer.

CAMPHAUSEN, kämp'hau-zen, OTTO VON (1812-96). A Prussian statesman. He was born in Hünshoven, studied at Bonn, Heidelberg, Munich, and Berlin, in 1844 was elected Councillor at Treves, and in 1845 became a member of the Ministry of Finance. In 1869 he was appointed Finance Minister, and in 1873 became Vice President of the Ministry. His administration marked a change from conditions of depression to those of great prosperity. Made accountable by his opponents for a subsequent reaction, attacked even by the Liberals, and at odds with Bismarck respecting the tobacco tax, he resigned (1878). He received the order of the Black Eagle shortly before his death.

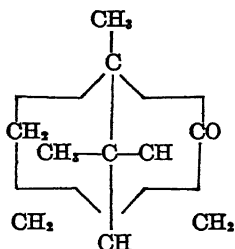
CAMPHAUSEN, WILHELM (1818-85). A German military and battle painter. He was born in Düsseldorf, where he studied under Alfred Rethel, then at the Academy under Carl Solm. His first paintings are historical subjects such as "Tilly at Breitenfeld" (Cologne Museum), "Cromwellian Troopers" (National Gallery, Berlin), "Charles I at Naseby" (Kunst-halle, Hamburg). Almost all of his later works are concerned with the history of Prussia. Among these are "Blücher Greeting Wellington" (Königsberg), "Düppel after the Assault" (National Gallery, Berlin), "Napoleon III after Sedan," and a series of colossal equestrian portraits of "Old Fritz," Emperor William, etc. He is also known as an etcher and illustrator. His work was especially admired by his contemporaries on account of his realistic treatment of detail.

CAMPHENE, kām'fēn or kām-fēn' (*Camphor* + *ine*). The name applied to purified oil of turpentine, which has been used for burning in lamps. It is very volatile and burns freely, giving a white, brilliant light. Its vapors (like those of gasoline and similar combustibles) form a dangerously explosive mixture with air.

CAMPHOR, kām'fēr (ML. *camphora*, from Ar. *kāfūr*, camphor, which is derived through the Prakrit *kāpūra*, Skt. *karpūra*, camphor), C₁₀H₁₆O. A substance obtained by the action of steam on the chipped wood of the camphor tree (*Camphora officinarum*, or *Cinnamomum camphora*, Nees). The product of distillation with steam is freed from volatile oil by draining and pressing, and the crystalline mass remaining behind is purified by sublimation. Camphor has also been prepared artificially by oxidizing the hydrocarbon camphene, C₁₅H₂₄, which may be ob-

tained by first treating terebenthene (an ingredient of turpentine) with gaseous hydrochloric acid and then heating with sodium carbonate. An American process, introduced in 1904, consists in heating oil of turpentine with anhydrous oxalic acid and oxidizing the resulting products. Pure camphor is a colorless, transparent, crystalline substance, melting at 175° C. and boiling at 204° C. It has a characteristic odor and a somewhat pungent, aromatic taste. It is only sparingly soluble in water, but dissolves readily in ether, chloroform, carbon disulphide, and other organic liquids. It has a tough consistency, but if digested with alcohol becomes hard and may then be readily pulverized. It is now employed in the manufacture of celluloid and of explosives, and is often used in medicine.

The constitution of camphor long remained an unsolved problem, in spite of innumerable efforts on the part of some of the most skillful organic chemists of the second half of the nineteenth century. The constitutional formula of camphor now known to be the correct one was first proposed by Bredt in 1893. But Bredt was unable to establish his formula on a definite experimental basis, and the constitution of camphor did not become fully known until 1903, when Komppa, at the University of Helsingfors, in Finland, succeeded in building up the molecule of camphor by a genuinely synthetic process. Three years later, in 1906, Perkin and Thorpe, at the University of Manchester, England, successfully completed a second synthetic method for the production of camphor, and so to-day the celebrated camphor problem may be considered as solved. Bredt's formula is as follows:



Komppa's now celebrated synthesis of this substance involved a number of steps. He first synthesized camphoric acid by starting with a mixture of ethyl oxalate and the ethyl ester of $\beta\beta$ -dimethyl-glutaric acid. By the action of metallic sodium this mixture yields the ethyl ester of diketo-apocamphoric acid. By the action of metallic sodium and methyl iodide upon the latter, Komppa obtained the ethyl ester of diketo-camphoric acid. Gentle reduction of this with sodium amalgam yielded the ethyl ester of dihydroxy-camphoric acid. Red phosphorus and hydroiodic acid changed dihydroxy-camphoric into dehydro-camphoric acid. The latter was transformed into its hydrobromide by hydrobromic acid, and then nascent hydrogen changed the hydrobromide into camphoric acid. The synthesis of camphoric acid thus achieved, the transformation of this acid into camphor itself is comparatively easy. The anhydride of camphoric acid is readily reduced by sodium amalgam into campholide. The latter, treated with potassium cyanide and hydrocyanic acid, gives homo-camphoric acid, and the distillation of the calcium salt of homo-camphoric acid gives camphor. Any

one who would examine the series of changes just enumerated would find, first, that all the substances mentioned can be and have been produced synthetically, and, secondly, that the processes by which the molecule of camphor is thus gradually built up from simpler molecules leaves no possible doubt as to the correctness of the constitutional formula of camphor shown above. Consult: Aschan, *Die Konstitution des Kampfers und seiner wichtigsten Derivate* (Brunswick, 1903). For details of Komppa's synthesis, consult his original paper in the *Berichte der deutschen chemischen Gesellschaft*, vol. xxxvi, p. 4332 (1903). For details concerning Perkin and Thorpe's contribution, consult their original paper in the *Transactions of the London Chemical Society*, vol. lxxxix, p. 795 (1906). See also BORNEOL.

CAMPHORIC ACID, $C_{15}H_{24}(COOH)_2$. An organic substance obtained by the oxidation of camphor with nitric acid. It occurs in needle-shaped crystals, colorless, odorless, and of slightly acid taste. It is nearly insoluble in cold water, but dissolves readily in hot water as well as in alcohol, ether, fatty oils, and other organic liquids. Camphoric acid is a mildly stimulating and disinfecting astringent, and has been used in chronic inflammatory conditions of the respiratory mucous membrane and as an anhidrotic (q.v.) in the profuse night sweats of phthisis.

CAMPHUYSEN, kâmp'hoi-zen, DIRK RAFFELSZ (1586-1627). A Dutch theologian and poet, born at Gorkum. He was a partisan of Arminius and was persecuted on that account. He wrote a compendium of the doctrine of the Socinians. He also left a number of religious poems, including a translation of the Psalms. He is said to have been a painter until his eighteenth year. The pictures attributed to him are probably by his nephew, RAPHAEL CAMPHUYSEN (1598-1657), an artist, or by his other nephew, Raphael's brother, GOVAERT CAMPHUYSEN (1624-74), who was court painter at Stockholm in 1653-63. Raphael painted moonlit scenes in the manner of Van der Neer. Govaert's works usually are landscapes with animals in Paul Potter's style. Consult Granberg, *Catalogue raisonné des collections privées de la Suède* (Stockholm, 1886).

CAMPI, kâmp'pè, or **CAMPO**. A family of Italian painters, of the school of Cremona.—GALEAZZO (1477-1536), founder of the family, was an imitator of Perugino and Boccaccino. His son and pupil, GIULIO (1502-72), studied also with Sojaro and formed his early style under the influence of Romanino and Pordenone, but later imitated Giulio Romano. He has the most individuality of all of his family, and his best pictures, which are fine in color, have considerable merit. The greater number are in Cremona and Milan.—ANTONIO (?-c.1591), the second son of Galeazzo, studied with his father and executed numerous commissions in Milan, Piacenza, Lodi, Brescia, Mantua, Cremona, and Madrid, where he was called by Philip II. The composition of his pictures is good, but they are poor and hard in color. He was also known as an architect and a writer.—VINCENZO (c.1530-91), a pupil of Giulio, was less able than his brothers, and devoted himself to portraiture and still life.—BERNARDINO (1522-c.1590), probably a relative of the preceding, was the son of a goldsmith, Piero Campi, and studied with Giulio and with Ippolito Costa at Mantua. He was first under

the influence of Giulio Romano and later of Correggio. The best examples of his religious pictures and portraits are in Cremona, San Colombario, Milan, and Mantua. He excelled in decorative friezes, emblems, etc. He wrote a treatise on painting, *Parere sopra la pittura* (1584). Among his pupils was Sophonisba Angussola (q.v.). Consult the biographies of these painters by Malaguzzi-Valeri in Thieme, *Allgemeines Lexicon der bildenden Künste* (Leipzig, 1911).

CAMPIDOGGIO, kām'pē-dō'lyō (It. *Capitoline Hill*, Lat. *Capitolium*). The Piazza di Campidoglio, with the famous group of palaces erected from Michelangelo's designs, occupies a depression on the Capitoline Hill in Rome between the ancient sites of the Citadel and the Temple of Jupiter. The edifices consist of the Palace of the Senator, opposite the grand flight of steps leading up from the Piazza d'Araceli, the Palace of the Conservators on the right as one enters the square, and the Capitoline Museum on the left. In the centre of the Piazza di Campidoglio stands a splendid antique equestrian statue in bronze of the Emperor Marcus Aurelius; while behind the Palace of the Senator rises a handsome late Renaissance bell tower, or campanile.

CAMPINAS, or **SÃO CARLOS DE CAMPINAS**, sou'n kār'lōs dā kām-pē'nās (Portug., plains). A town of Brazil on the Piracicaba, 70 miles northwest of São Paulo (Map: Brazil, H 8). Campinas is the trade centre and outlet of the coffee and sugar producing region surrounding it. It is the starting point of the Mogyana Railway and is connected with the port of Santos by the Paulisto and São Paulo Railway. Pop. (1890) of the city and municipality, 33,921.

CAMPION. See LYCHNIS; SILENE.

CAMPION, EDMUND (1540-81). An English Jesuit. He was born in London, was educated at Oxford, and in 1567 was ordained deacon, but as he could not consent to the Protestant formulary as required by the English church, he went to Ireland, where it was expected that the University of Dublin would be revived. That plan failing, he went (1571) to Douai, and there joined the Society of Jesus (1572). In 1580, disguised as a jeweler, he was sent to England with Robert Parsons (q.v.) as a missionary by William Allen (q.v.). The next year he published *Decem Rationes*, an attack on Anglicanism, for which he was arrested, committed to the Tower, tortured several times on the rack, subjected to prolonged disputations, was tried for treason and convicted, and was hanged at Tyburn, London. Elizabeth had offered him advancement if he would recant. Pope Leo XIII beatified Campion in 1886. Consult Simpson, *Edmund Campion* (London, 1867).

CAMPION, THOMAS (c.1566-1620). Little is known of the life of this English poet, musician, and pioneer—if not to good purpose—in the art of English literary criticism, who, after enjoying considerable reputation in his day, was, with the triumph of Puritanism, almost forgotten for more than two centuries, until Mr. A. H. Bullen, in 1889, collected and published his poems in a volume which promptly put Campion in the front rank of Elizabethan lyrists, alike for freshness and depth of feeling, for the varied music of his shifting rhythms and flowing cadences, and for the felicity of his diction and phrasing. He himself, however, set little store by his rhymes, though literally dozens of them are amongst the most delightful

things in the language; and he spurned them in set terms in his *Observations in the Art of English Poesy* (1602), a misguided critical treatise, which pleads for rhymeless verse. The unmeasured enthusiasm, which displaced the neglect of Campion, now, as Bullen says, "runs the risk of making him the object of uncritical adulation" (prefatory note to *Songs and Masques*, 1903). Of Campion's life well-nigh all that is known is told when it is said that he studied at Cambridge and at the Inns of Court; that he became a popular physician in Elizabethan London; that he composed the music of songs, wrote English and Latin poems, masques for the court of James I, a treatise on poetry (named above) and another on counterpoint; and that he made friends and enemies among men of letters. His publications include, besides the *Art of English Poesy: Poemata* (1595); *A Book of Airs* (1601); *Two Books of Airs* (1612?); *Third and Fourth Book of Airs* (1617?); and *A New Way of Making Four Parts in Counterpoint* (1617?). Consult: *Works* (1889), ed. by A. H. Bullen, which excludes *A New Way*, etc.; *Songs and Masques* (1903), ed. by A. H. Bullen, and containing *The Art of English Poesy* and an introduction on Campion's music by Janet Dodge; *Complete Works* (Clarendon Press, 1908), ed. by P. Vivian.

CAMPISTRON, kām'pēs'trōn', JEAN GALBERT DE (1656-1723). A French dramatic poet. He was born in Toulouse and at an early age went to Paris, where he became a follower of Racine. His works have neither well-marked character nor striking situations, but many of his tragedies had a contemporary success. Among his works are: *Virginie* (1683); the libretto for Lully's opera, *Acis et Galatée* (1686); *Andronic* (1685), which has the same historical background as Schiller's *Don Carlos*; and *Tiridate* (1691). The best edition of his works is that of 1750 (3 vols.), which contains a biography. *Œuvres choisies* (Paris, 1810) were published by Auger. In 1701 he was elected to the French Academy.

CAMP MEETING. A series of religious meetings held in the open air, usually in the woods, and participated in by families or groups of persons from a distance, who live in tents or in simply built houses during the sessions and devote the greater part of the time to listening to preaching, which is always direct and fervent and is usually accompanied by a "revival." The first held in the United States was in 1799, at a settlement on Red River in Kentucky, and was the outcome of the preaching of Rev. John M'Gee, a Methodist, his brother, a Presbyterian, and Rev. Mr. Hoge, also a Presbyterian, at a communion service. Their exhortations affected their audience so strongly that crowds came from the surrounding country to hear confessions and "testimonies," and the meeting, transferred from the small meetinghouse to the adjoining forest, was protracted for several days, and was followed by others in different places. The number of persons attending one camp meeting in Kentucky was estimated at 20,000. At first Presbyterians and Baptists united with the Methodists in holding these meetings, but they soon came to be confined to the last-named denomination, which in all its branches has been most enthusiastic in supporting them and in introducing them into all parts of the country. In many States camp meetings have lost some of the characteristics of early days, the places of meet-

ing being fixed and the life less simple. Not unfrequently secular instruction is a feature, schools of languages, music, art, etc., and lectures on various topics filling the time not occupied by religious services. Among the many popular camp-meeting grounds of the Methodist Episcopal church are Round Lake, N. Y., Ocean Grove, N. J., Martha's Vineyard, Mass., Lakeside, Ohio, Bartley, Neb., and Pacific Grove, Monterey, Cal.

Lorenzo Dow (q.v.) introduced camp meetings into England in 1807, but the Wesleyan Conference refused (as it still does) to sanction them, and to this attitude was partly due the organization of the Primitive Methodist denomination in 1810. Consult: *An Essay on Methodism* (New York, 1849); J. Porter, *Revivals of Religion* (1877); S. C. Swallow, *Camp-Meetings* (1878).

CAMPOAMOR Y CAMPOOSORIO, kām'pō-ā-mōr' ē kām'pō-ō-sō-rē-ō, RAMÓN DE (1817-1901). A Spanish poet, politician, and philosopher. He was born in Navia, Sept. 24, 1817, and received a classical education in Santiago and at the Jesuit College of St. Thomas in Madrid, which he left without finishing his course. He then began the study of medicine at the College of San Carlos, but abandoned it to devote himself to journalism and literature. Throughout his life, however, he kept a strong interest in physiological and physical science and especially in chemistry. He entered political controversy with the *Historia crítica de las Cortes reformadoras* in 1837; was several times elected to the Cortes, where he distinguished himself as an orator; was appointed Governor of Alicante and Valencia in 1854; and engaged in a long controversy with Castelar which is represented by his *Polémicas con la democracia* (1862). He took no part in politics from the Revolution of 1868 until the succession of Alfonso XII in 1874, after which he held several subordinate offices, was made Councillor of State, and later life Senator. He refused the title of Grande de España. His attitude in politics was always that of a moderate conservative, distinguished for his eloquence and his chivalric faithfulness to the royal family.

His trend towards philosophical thought was shown in *La filosofía de las leyes* (1846) and confirmed in *El personalismo* (1850 and 1855); he attempted to expound his system in *Lo absoluto* (1862 and 1865) and *El idealismo* (1833), the two works by which he is best known outside of Spain, and which have an added interest through their bits of revelation of the author himself. His philosophy is a somewhat incoherent and often self-contradictory eclecticism, tending on the whole to subjective idealism.

By far his most important work was done in poetry. Lightness, grace, and delicate sensibility marked his early verse: *Ternezas y flores* (1840) and *Ayes del alma* (1842). The *Fábulas morales y políticas*, first published in 1842, were added to in many successive editions. His most characteristic short poems are to be found in the *Doloras* (1846-90, 18 eds., each containing new work), an ancient type of poem for which he invented a new name. This caught the fancy of the younger school of Spanish poets, who freely imitated him in the belief that he had created a wholly new type of poem. These poems condensed into brief lyric form the expression of philosophical, ethical, and social ideas, treated sometimes with bitter irony, but always with feeling. He attempted long narrative poems in his epic on Columbus (*Colón*, 16 cantos, 1853

and 1857) and *El drama universal* (1873), but these are less successful than the shorter narratives, which contain some of his best work: *Los pequeños poemas* (1879, 1886); *Los buenos y los sabios* (1881); *El amor y el río Piedra* (1882); *Los amores de Juana* (1882); *El trén express* (1885); *Nuevos pequeños poemas* (1887); *Humoradas* (1890). *La niña y el nido*, *Los grandes problemas*, and *Por donde viene la muerte* are among the best. He also wrote many plays in verse, none of which succeeded on the stage. They are full of humor and feeling and rich in ideas, but are lacking in dramatic movement. The best known are: *Una mujer generosa* (1838); *Dies Ira* (1873); *El honor* (1874); *Guerra á la guerra*; *Así se escribe la historia* (1875); *Glorias humanas* (1885); *Queridos y locos* (1887); *El palacio de la verdad* (1871); etc. He published his theory of poetry in *La poética* (1883), completed in a new edition (1890), and in *La metafísica y la poética* (1891). His last poems of importance are *El licenciado Torralba*, a philosophico-ethical narrative poem, and *Nuevos poemas* (1892). He became a member of the Spanish Academy in 1861.

Campoamor's narrative poetry at its best may be compared with that of Victor Hugo. In his usual choice of subjects he rather resembles Coppée, to whom, however, he is distinctly superior in conception and treatment. In poems of sentiment and thought, such as the *Poesías y fábulas* and the *Doloras*, he has close affinity with Sully-Prudhomme, and the *Licenciado Torralba* attempts the same task as Sully-Prudhomme's *Bonheur*. In spite of these relations he is the most original and independent of nineteenth-century Spanish poets and is by many considered the greatest of the last half-century. He is the poet of subjectivity par excellence in all Spanish poetry and finds fit lyric expression for thought as do few poets of any country.

His *Obras completas* were edited by Montaner y Simon (Barcelona), and again by V. Serrano, V. Colorado, and M. Ordóñez (8 vols., Madrid, 1901-03). Selections from his poetry were published (Madrid, 1879, and Leipzig, 1885). Consult: Juan Valera, *Estudios críticos* (Madrid, 1864); Fr. Giner, *Estudios literarios* (Madrid, 1866); Melchior de Palau, *Acontecimientos literarios* (1889); Sánchez Pérez, *Ramón de Campoamor: estudio crítico-biográfico* (2d ed., Madrid, 1889); A. González-Blanco, *Campoamor: biografía y estudio crítico* (Madrid, 1912).

CAMPOBASSO, kām'pō-bās'sō (It. *campo*, Lat. *campus*, field + *basso*, Late Lat. *bassus*, low). A city in south Italy, capital of the Province of Campobasso, 52 miles north of Benevento, on the east slope of Monteverde, in the heart of the Apennines, 2400 feet above sea level (Map: Italy, J 6). The climate is cool and healthy, and the town has a ruined castle and walls, a cathedral, a theatre, excellent institutions of learning, important manufactures of cutlery, and a famous market to which good roads lead from the surrounding country. Pop. (commune) 1881, 15,000; 1901, 15,030; 1911, 16,579.

CAMP/POBEL/LO (It. *campo*, Lat. *campus*, plain + *bello*, Lat. *bellus*, beautiful). An island of New Brunswick, Canada, situated just outside of the Maine, United States, boundary, at the mouth of Passamaquoddy Bay, an inlet of the Bay of Fundy, in lat. 44° 57' N. and long. 66° 55' W. (Map: New Brunswick, C 4). The island, from nine to ten miles long and from

two to three miles wide, has a picturesque coast abounding in fiords, chasms, cliffs, and pleasant beaches. At the north end is a lighthouse 60 feet in height. The well-wooded interior is intersected in all directions by fine walks and drives. It contains copper and lead ores, but the industrial portion of the population is chiefly engaged in fisheries, and during the season in attending to the wants of the residents of the numerous summer homes and hotels, some of the best along the Atlantic coast. The island's development dates from its acquisition by a syndicate of Boston and New York capitalists in 1880. From 1767 it had been in the possession of Admiral William Owen's family. The United States is represented by a consular agent. Pop., 1910, 1230.

CAMPO-FORMIO, kām'pō-fōr'myō, now officially written CAMPOFORMIO. A village in the Province of Udine, northern Italy, about 7 miles southwest of the city of Udine. It is celebrated for the treaty of peace concluded there Oct. 17, 1797, between Austria and the French Republic. After overrunning Italy, Bonaparte had crossed the Alps and threatened Vienna. Austria therefore hastened to arrange preliminaries of peace at Leoben, April 18, 1797. In the treaty which was concluded by Bonaparte with the Count von Cobenzl at Campo-Formio, Austria ceded the Belgian Netherlands to France, and gave up Lombardy, to be incorporated into the Cisalpine Republic, and received as compensation most of the territories of the Republic of Venice (which Bonaparte had extinguished), including Venetia (with the city of Venice), Venetian Istria, and Dalmatia. France took the remaining territory of Venice, its possessions in Albania, and the Ionian Islands.

CAMPO MAJOR, kām'pō mā-zhōr'. A city in the Province of Alentejo, Portugal, 11 miles northeast of Elvas (Map: Portugal, B 3). It is situated at an elevation of about 950 feet, has a meteorological observatory and manufactures wine and woolen goods. It was the scene of a siege in 1811 during the Peninsula War, which has been celebrated by Scott in his ballad entitled "The Bold Dragoon." Pop., 1890, 5864; 1900, 5895.

CAMPOMANES, kām'pō-mā'nās, PEDRO RODRIGUEZ, COUNT (1723-1802). A Spanish statesman and political economist. He was born in Asturias. His talents and learning were devoted to the advancement of his native country. He acquired a high reputation for legal attainments and was appointed fiscal and subsequently President (1788-93) of the Supreme Council of Castile. He held other high offices, among them that of director of the Royal Academy of History in Madrid. By his enlightened view of state policy as well as by his writings, which gave him a place among the most eminent Spanish authors, he obtained a great reputation throughout Europe. His attention was chiefly devoted to economic studies. He pointed out how the impoverishment of Spain was due to oppressive laws that tended to discourage commerce and industry. He sided with Count Aranda in his policy of expelling the Order of the Jesuits from the Spanish dominions. Campomanes was a man of great intelligence and the highest probity, and gained the affection and admiration of all his associates. At the suggestion of Benjamin Franklin, Campomanes was chosen an honorary member of the Philosophic Society of Philadelphia. He was also a corresponding member of the Académie des Inscriptions et Belles-Lettres, of Paris.

His chief works are: *Disertaciones históricas del order y caballeria de los Templarios*, which was his first work (1737); *Antigüedad marítima de la república de Cartago* (Madrid, 1756); *Tratado de la regalía de amortización* (1765); *Discurso sobre el fomento de la industria popular* (1771); *Discurso sobre la educación popular de los artesanos* (1775). To this last work he published four important appendixes each larger than the original essay, and dealing respectively with the decline of arts and manufactures in Spain, with the measures necessary for a restoration thereof, with the guild laws, and with national commerce. These appeared in 5 vols., Madrid, 1774 and 1777. Consult the biographical notice by Antonio Rodríguez Villa, which serves as an introduction to the 1st ed. of his *Cartas político-económicas* (1878).

CAMPORI, kām-pō'rē, CESARE, MARQUIS (1814-80). An Italian historian, born in Modena. His masterpiece is *Raimondo Montecuculli i suoi tempi e la sua famiglia* (Florence, 1876). A posthumous collection of his works was entitled *Memorie patrie, storiche e biografiche* (Modena, 1882). In the Biblioteca Estense at Modena is the remarkable Campori collection of 10,000 autographs. Consult Ricci, "Cesare Campori," in *Ritratti e profili politici e letterarii* (Florence, 1880).

CAMPOS, kām'pōsh (Portug., plains, Lat. *campus*, field). A city of Brazil, in the State of Rio de Janeiro, on the Parahyba River, which is navigable for small steamers to this point, about 30 miles from its mouth (Map: Brazil, J 8). It has good railroad connections, and canals extend to the coast. The city is lighted by electricity and contains several fine buildings. It has an important trade as the centre of a fertile region producing sugar cane, coffee, rice, and cotton, and has a number of sugar refineries. Campos was founded in 1730. Pop., 1890, 78,036, one-half of whom were negroes; 1902 (est.), 30,000.

CAMPOS. The Brazilian term for tropical prairies or savannas. Campos in which trees are common are called *campos cerrados*. See GRASSLAND; SAVANNA.

CAMPOS, ARSENIO MARTINEZ. See MARTINEZ CAMPOS.

CAMPO SANTO, kām'pō sām'tō (It. *campo*, Lat. *campus*, field + *santo*, Lat. *sanctus*, holy). The Italian designation of a cemetery or burying ground, but more especially for an inclosed place of interment, surrounded internally by an arcade, for the burial of persons of distinction. See CEMETERY.

CAMPOS SALLES, kām'pōsh, sāl'sh, MANOEL FERREZ DE (1846-1913). A South American politician and President of Brazil, born in São Paulo. He was admitted to the bar, was elected in 1867 and frequently thereafter to the Legislature of São Paulo, and in 1844 became a member of the Chamber of Deputies. As Minister of Justice, upon the proclamation of the Republic, which he had done much to bring about, he thoroughly reorganized the Brazilian system of law along lines subsequently accepted by the Constituent Assembly. After having served for some time as Governor of the State of São Paulo, he was in 1898 elected President of Brazil, as candidate of the Republican party. He held this position until 1906. His administrations were characterized by many successful reforms in finance and administration, and by the peaceful settlement of boundary disputes with many of the adjacent countries, and by the

equally peaceful settlement through arbitration of various questions with European nations. During his presidency occurred, too, the first exchange of presidential visits between Argentina and Brazil. The results of this exchange were of importance in clearing up difficulties between the two countries.

CAMPO VACCINO, kām'pō vā-chē'nō. See FORUM, *Later History*.

CAMPRODON, kām'prō-dōn', FRANCISCO (1816-70). A Spanish dramatic poet. He was born at Vich, Barcelona, studied at the University of Cervera, and began the practice of law. He first attracted attention by his poem *La tornada de Titó*, written in the Catalan dialect, upon the return of the Spanish army from the African War. Some of his dramas are adaptations from foreign works. He was not what Spain would call a prolific writer, although he produced more than 30 dramas, comedies, and *zarzuelas*. The most important original work is *Flor de un día* (1851). The rights to this play he did not sell, introducing thus the custom, new to Spanish playwrights, of asking royalties on the performance of plays. This particular play earned him \$20,000. For a while he served in politics and sat in the Cortes of 1854 and during the five years of the régime of the *Unión Liberal*. Despite his public activities he loved home life and considered himself a master of the culinary art. He even invented a celebrated rice dish that his friends called *Arroz Camprodon*. He died in Havana, whither he had been sent to assume charge of an important position in public administration.

CAMP/TONITE. A variety of igneous rocks that occurs in dikes and is composed of hornblende, biotite, and augite in porphyritic crystals set in a ground mass of the same minerals and andesine. Its appearance in hand specimen is very similar to basalt, and its identification ordinarily requires the assistance of the microscope. Camptonite has been described from numerous localities in the Eastern States, chiefly within the central crystalline section of the Appalachian Range. The name is from the town of Campton, N. H., where dikes of the rock were first described by G. W. Hawes.

CAMP/TOSAURUS (Neo-Lat., Gk. *καμπτός*, *kamptós*, bent + *σαῦρος*, *sauros*, lizard). A genus of herbivorous, bird-footed dinosaurs of which remains are found in the Jurassic rocks of Wyoming. The genus is closely allied to the fossil genus *Iguanodon* of the European Jurassic, which it much resembles. The animal was lightly built, and as its five-toed fore limbs were small and apparently of little use in locomotion, it must have progressed on its three-toed hind limbs after the fashion of a bird. Its neck was rather short, but slender and birdlike, and its small head was provided with a horny beak. The tail was long and heavy. Three species have been recognized; of these the largest, *Camptosaurus amplius*, had a length of 30 feet and a height of 15 feet. See DINOSAURIA.

CAMPULUNG, or **KIMPOLUNG**, kām'pō-lōng'. A town of Rumania, capital of a circle, situated on a small tributary of the Arjish. It forms the terminus of the railway line from Colestchi and had a population of 13,033 in 1899.

CAMPUS (Lat., field). In Roman times a vacant space in or near a city, used for public shows, combats, etc. There were eight around Rome, of which the Campus Martius (Field of Mars) was the most important. It was outside

the walls, occupying the level space north of the city, between the Pincian, the Quirinal, and the Capitoline hills on the east, and the Tiber on the west. In later times (especially from about 60 B.C.) this space was much reduced by private and public buildings, and the name was limited to the space between the river, the Circus Flaminius, and the Via Lata. In this met the *Comitia Centuriata* and the *Comitia Tributa* (see COMITIA); in it were the public hall for the use of the magistrates and foreign ambassadors, who were not permitted to enter the city, and the Ara Martis (Altar of Mars), said to have been erected by Romulus. The Campus Martius became in time a pleasure ground, with shaded walks, gardens, baths, three theatres, and a race course. Julius Cæsar began the change by erecting a stone structure called *Sæpta*, for the voting of the people, but Agrippa did most for the place by erecting many structures, among them his baths and the original Pantheon; Augustus added his own mausoleum and the Ara Pacis. Later emperors crowded this particular campus with public buildings and private residences. It was certainly not within the *pomerium* before the time of Hadrian, but whether it was included by him or by Aurelian is uncertain. Consult Platner, *The Topography and Monuments of Ancient Rome*, pp. 339-392 (New York, 1911). The district in which the old Campus was situated is now called Campo Marzio; the major part of the modern city of Rome lies here. Another ancient campus was the Campus Sceleratus, the polluted field, where vestals who had been untrue to their vows of chastity were buried alive. This lay inside the Servian Wall, southwest of the Porta Collina. (See COLLINE GATE; CAMPUS ESQUILINUS.) The open grounds around American colleges often bear the name of campus.

CAMPUS ESQUILINUS. A tract of land outside of the Servian agger at Rome, 1000 feet long, 300 wide, once used as a burial place for slaves, the lower classes, and malefactors, whose bodies were thrown into common pits. Its unsanitary condition made it a menace to the city, and the cemetery was suppressed under Augustus. Mæcenæ covered the whole region with clean earth to the depth of 25 feet, and on the new-made land laid out his famous gardens. Consult Horace, *Satires*, 1, 8, 8-13; Lanciani, *Ancient Rome in the Light of Recent Discoveries*, pp. 65-67 (New York, 1889); Platner, *The Topography and Monuments of Ancient Rome*, pp. 445-446 (New York, 1911).

CAMPUS MARTIUS. See CAMPUS.

CAMPUS SCCLERATUS. See CAMPUS.

CAMP/PYL/OTROPOUS (Gk. *καμπύλος*, *campylos*, curved + *τρόπος*, *tropos*, turn). A term used to indicate one of the characters of an ovule. When an ovule arises from the wall of an ovary, and the body becomes curved in such a way as to direct the micropyle towards the wall, it is campylotropous. The term really means a "curved ovule." The significance of the curving is that it places the micropyle in a more convenient position for the entrance of the pollen tube containing the sperms. The contrasted terms are anthotropous (straight ovule) and anatropous (inverted ovule).

CAMTOOS (kām-tōs' or kām-tōōs') **RIVER**. See GAMTOOS.

CAMUCCINI, kām'ūōō-chē'nē, VINCENZO (1771-1844). An Italian historical and portrait painter. He was born in Rome and re-

ceived his first instruction from his brother Pietro, who apprenticed him to Domenico Corvi, an able draftsman; he also copied the works of Raphael and Michelangelo, and studied from the nude. On the advice of the archaeologist Visconti, he made a deep study of classical antiquity and became the most important representative of the academic classical period in Italy, holding a similar position to that of David in France. He was a member of the Institute of France, and from 1806 princeps of the Academy of St. Luke at Rome. His most celebrated works are "Romulus and Remus" in the Academy of St. Luke; "The Death of Virginia" and "The Death of Caesar" in the Capo di Monte Palace, Naples; "The Incredulity of St. Thomas," a mosaic at St. Peter's, and the "Conversion of St. Paul" in the basilica of St. Paul outside Rome. He was also celebrated for his portraits, numbering among his sitters Thorvaldsen, Pope Pius VII, and the King and Queen of Naples. He assembled a valuable collection of pictures and objects of art, 70 of which were purchased in 1876 by the Duke of Northumberland.

CAMUS, kă'my', ARMAND GASTON (1740-1804). A French politician, born in Paris. His legal ability and radical zeal brought him into prominence after 1789. He secured and published the so-called "Red Book," which contained a damaging record of court extravagance. He was, as member of the Convention, the most emphatic opponent of all secret orders and ecclesiastical privileges. In 1793, while attempting to capture Dumouriez, who was charged with treason, he was himself captured. After two years and a half the Austrians exchanged him for the daughter of Louis XVI, and on his arrival in Paris he evoked a great deal of sympathy by recounting the hardships of his confinement. The Council of Five Hundred made him a member by legislative enactment, and subsequently he became president of that body. His best service was performed when, as conservator of the national archives, he preserved from destruction the old documents of the abolished corporations and institutions. He wrote a number of valuable legal works. He died Nov. 2, 1804.

CAMWOOD (African *kambe*, native name for the tree + Eng. *wood*), or **BARWOOD**. A dye-wood which yields a brilliant but not permanent red color and is used with sulphate of iron to produce the red color in English bandanna handkerchiefs. It is the wood of *Baphia nitida*, a tree of the family Leguminosæ, a native of Angola. It is preferred to brazilwood, as producing a finer and richer red.

CANA. See **CANA OF GALILEE**.

CANAAN, kă'nān (Heb. *Kena'an*, Gk. *Xávaav*, *Chanaan*; Phoen. *Kena'an*, *Kena'*, Gk. *Xvā Chna*; Bab. *Kinahi*, *Kinahna*, corresponding to *Kena'* and *Kena'an*, Eg. *K'n'n*). The name of the putative ancestor of the Canaanites (q.v.) and a common designation in the Old Testament of the land to the west of the Jordan, most frequently limited to the territory occupied by the kingdoms of Judah and Israel, but sometimes including Philistia (e.g., Zeph. ii. 5) and Phœnicia (e.g., Isa. xxiii. 11; Obad. 20). According to Gen. x. 6 ff. Canaan was a son of Ham, a brother of Cush, Mizraim, and Put, and the father of Sidon and Heth. In Gen. ix. 20-27 the story is told of him that he was cursed because of a wrong done to Noah, not by him,

but by Ham. Noah, the first husbandman and cultivator of the vine, becoming drunk with wine, lay uncovered in his tent. Ham saw his father's nakedness and told his brothers, Shem and Japheth, who covered their father with a garment, walking backward so as not to see him in his exposed state. Since in the poem that is introduced (verses 25-27) the three brothers are Shem, Japheth, and Canaan, and it is Canaan, and not Ham, that is cursed, it is supposed by many students of the Bible that the story was originally told of Canaan, and that Ham is a later addition in verse 22. The purpose of the story, they think, was to illustrate the evils of agriculture in general (see **ABEL**) and of the cultivation of the vine in particular, to set forth the sexual immorality of the Canaanites, and to justify the occupation of their land by the Hebrews and the Philistines. Shem is regarded as an early name of a congeries of tribes belonging to the Hebrews in the wider sense, Japheth as a designation of the Philistines, Cretans, and kindred tribes, and Canaan as a representative of the Canaanites, one of the most important ethnic elements in the population of Syria before the immigration of Hebrews and Philistines. As the tradition grew so as to include all peoples known to the Judæan writers, Ham is supposed to have taken the place of Canaan. Some scholars consider it improbable that the Canaanites should have been grouped with Libyans, Egyptians, and Hittites, unless there actually was some racial connection between them. Against this view the objection has been raised that Elamites and Lydians are classed as descendants of Shem, in the table of nations (Gen. x.), though they can scarcely be regarded as Semites. But recently discovered inscriptions have not only shown an early and long-continued occupation of Elam by the Akkadians and of a part of Asia Minor by the Assyrians, but also rendered it probable that there was a considerable Semitic population in both of these regions. (See **ELAM**; **ASSYRIA**.) Similarly, the long Egyptian and Hittite rule in Syria must have left important traces in the Canaanitish population, and some striking similarity of appearance is all the more likely to have suggested a common origin, as the obvious difference of speech must have seemed to militate against it. It is possible, as Brinton, Keane, Sergi, Luschan, and other ethnologists have maintained, that in prehistoric times Egypt, Syria, and Asia Minor were peopled by the Libyan branch of the Mediterranean race, and that this ancient stock survived among, and greatly modified, the Semites settling in Canaan. If so, it may be supposed that this aboriginal element was most strongly represented along the littoral and in the coastal plains, but that the Amorites (q.v.) at an early age imposed their Semitic speech upon the whole country. But a tradition reaching back to so remote a period cannot well be assumed, while the Egyptian and Hittite sway may have been preserved in memory, especially as Hebrew tribes seem to have been in Palestine already in the Amarna period (c.1400 B.C.). The Phœnicians looked upon themselves as the descendants of Canaan, or Kna' (without the final *n*), according to the testimony of Philo Byblius preserved in Eusebius, *Præp. Ev.*, 1, 10, 39, and of Chæræoboscus in *Anecdota græca*, ed. Bekker, iii. 1181.

The earliest mention of Canaan as the name of a country is found in the Tel el-Amarna tab-

lets. Kinahhi (Kena') occurs five times, Kinahni or Kinahna (Kena'an) six times. The name is used interchangeably with Amurru for the land subject to the Amorite Aziru (162, 41), but mostly as a general designation of Syria. In the Egyptian inscriptions a "city in Canaan (Kn'n)" is mentioned in the time of Seti I (c.1330-10), Canaan apparently as Phœnicia in Merenptah's "Israelstele" (c.1240), Canaan apparently as within the territory of Phœnicia in the days of Ramses III (c.1217-1186), and "the land of Canaan" apparently as Philistia in two papyri from the nineteenth dynasty. In the Old Testament there are passages, like Gen. 1. 11 and Josh. xi. 10 f., from which it has been inferred that Canaanites also lived on the east side of the Jordan, but the present text is far from certain. There seem to be indications that the name spread from the coastal plains to the interior, as that of the Canton Schwyz has been extended to the Swiss Republic, or that of the Philistine confederacy became the designation of the whole land of Palestine. Coins from the time of Antiochus IV and his successors bear the legend "of Laodicea, a metropolis in Canaan." Moore has shown (*Journal of the American Oriental Society*, 1893, pp. lvii ff.) that the once popular etymology of Canaan as "lowland" cannot be maintained. It is also possible that the land was named after the people, and not the people after the land. How old the name is cannot be determined. It is not safe to infer that it came into use shortly before its first appearance in the Tell el-Amarna letters; but neither can it be affirmed that the inhabitants of the coast must for ages have borne this name, or that it is necessarily of Semitic origin. We have unfortunately no paintings or sculptures that can with certainty be identified as representations of Canaanites, Phœnicians, or inhabitants of the Shephela before the Philistine invasion. What the original language of Canaan was is not known; in later times the term was understood to mean Hebrew or the closely allied Phœnician dialect. For the geology, geography, flora, and fauna of the land called Canaan, as well as for its history from the earliest times to the present day, see PALESTINE; PHœNICIA; SYRIA.

Bibliography. W. Max Müller, *Asien und Europa*, pp. 146 al. (1893); H. Vincent, *Canaan*, pp. 453 ff. (1907); Böhl, *Kanaanäer und Hebräer* (1911); Ed. Meyer, art. "Canaan" in *Encyclopædia Biblica*; id., *Geschichte des Altertums*, i, 2 (3d ed., 1913); Procksch, *Die Völker Altpalästinas* (1914).

CANAANITES (Heb. *Kena'ani*, Bab. *Kina-ai*, Phen. *Kena'ni*, Latinized *Chananaei*). The name of an ethnic element in the population of Syria, sometimes used as a designation of all the inhabitants of the country to the west of the Jordan and the Phœnician coast. In the Amarna tablets it occurs once (ix. 19, ed. Knudtzon) in the form *Ki-na-ha-a-u*. The Phœnicians called their country Canaan in the Hellenistic period (see CANAAN), and therefore are likely to have called themselves Canaanites. As the Carthaginians as late as in the time of Augustine referred to themselves as Canaanites (Augustine, *Ep. ad Roman. inchoat expos. 19*), it is probable that this was the native name which the colonists carried with them to the west at the end of the second millennium B.C. In the Old Testament the Canaanites

are commonly enumerated in a group of peoples settled in Palestine before the Hebrew invasion. In Deut. vii. 1; Josh. iii. 10; xxiv. 11, this includes seven, viz., Amorites, Canaanites, Hittites, Perizzites, Hivites, Jebusites, and Girgashites; in Gen. xv. 19, 20, the Hivites are left out, but Kenites, Kenizzites, Kadmonites, and Rephaites are added, making the number 10; frequently one or more of the less important peoples are omitted; only Canaanites and Perizzites are mentioned in Gen. xiii. 7; xxiv. 30, and in imitation of these passages in 2 Esdras i. 21, and in Ezek. xvi. 3 Amorites and Hittites are said to be the ancestors of Jerusalem in "the land of the Canaanite." That the Amorites were essentially a Semitic people may be taken for granted, though it is possible that there was a considerable admixture of foreign blood through contact with, and absorption of, other elements in Syria. (See AMORITES.) The Hittites were a non-Semitic Asianic people. (See HITTITES.) It is not improbable that the Perizzites had a strain of Mitannian blood. (See MITANNIANS.) The Hivites seem to have been a branch of the Amorites, as may be inferred from a comparison of Gen. xxxiv. 2 with xlviii. 22 and Josh. ix. 7 with 2 Sam. xxi. 2, though here also there may have been a mixture of blood. Böhl suggests that the Jebusites were a mixture of Amorites and Hittites; this was indeed more than hinted at by Ezekiel. This people was clearly confined to Jerusalem and the district around the city. The Girgashites were probably settled around the Lake of Galilee, where Amorites and Canaanites met. Kenites (see CAIN), Kenizzites, and Kadmonites appear to have been Edomitish peoples—the two former in the Negeb (q.v.), the latter on the border of the Syro-Arabian Desert. As for the Rephaites and the Zuzites and Emites mentioned in connection with them in Gen. xiv. 5, they probably represent an earlier stratum of the population in the country east of the Jordan and the Dead Sea. Amorites, Canaanites, and Hittites were evidently the most important peoples with which the invading Hebrew tribes had to deal, the others being smaller tribes or clans mentioned because they held possession of cities like Jerusalem and Shechem. The use of *Amurru* and *Hatti* by the Babylonians and Assyrians, *Amor* and *Kenana* by the Egyptians, also points to the same conclusion. The extension of each of these terms to the whole likewise furnishes an instructive analogy to Hebrew usage. On the origin and ethnic character of the Canaanites, see CANAAN; on the nature of the civilization of the country before the coming of the Hebrews, see PALESTINE; PHœNICIA; SYRIA. Consult: Vincent, *Canaan* (1907); Ed. Meyer, *Die Israeliten und ihre Nachbarstämme* (1906); id., *Geschichte des Altertums*, i, 2 (3d ed., 1913); Benzinger, *Hebräische Archæologie* (2d ed., 1907); Kittel, *Geschichte des Volkes Israel*, i (2d ed., 1912); Böhl, *Kanaanäer und Hebräer* (1911); Procksch, *Die Völker Altpalästinas* (1914).

CANA-BOTA, kân'a-bō'tā. A very large shark (*Hexanchus*, or *Notidanus, griseus*), inhabiting deep waters off the coast of Europe and in the Mediterranean and wandering to the West Indies. It reaches a length of 26 feet. See SHARK and Plate of LAMPREYS AND DOGFISH.

CANACE, kân'a-sé (Lat., Gk. *Κανάκη, Kanakē*). The offspring of Æolus, the king of the winds (see ÆOLUS), and Enarete, in Greek

mythology, who conceived an incestuous passion for her brother, Macareus, and was punished for it by death. The story is finely told by Ovid, *Heroides*, xi. Gower mentions her in the *Confessio Amantis*, and Chaucer in the *Man of Law's Tale*. She is not, however, to be confused with the Canace in the latter author's *Squire's Tale*, who is the daughter of King Cambuscan, and who, owing to the possession of a magic ring, can understand the love plaint of a female hawk.

CANADA (probably from Iroquois *kanada*, cabin), **DOMINION OF**. A country occupying the whole of the continent of North America north of the United States, except Alaska. (See special map, accompanying this article.) The continental portion is about 2700 miles in greatest length, from the Atlantic to the Pacific, and measures about 1600 miles from north to south, which gives to it, with the outlying "lands" and islands, an area exceeding the United States with Alaska and nearly equal to that of all Europe; somewhat more than one-sixth of this is under water. The Dominion is divided for administrative purposes into nine provinces, the Yukon Territory, and the Northwest Territories. Provincial boundaries were revised in Manitoba and eastern Canada in 1912. By this revision Manitoba was increased by 178,100 square miles on the north and made to extend to the sixtieth parallel of north latitude and Hudson Bay. Ontario received 146,400 square miles of additional territory so as also to attain Hudson Bay. This new district is called Patricia. Quebec acquired 354,961 square miles of new area, made up of what was formerly known as the Territory of Ungava and the whole of Labrador situated within the Dominion. By this addition Quebec becomes the largest province in Canada instead of British Columbia, which drops to the third rank in area, Ontario being second. Excluding Hudson Bay (443,750 square miles) and the Gulf of St. Lawrence (101,562 square miles), but including inland waters, the area of the Dominion is 3,729,665 square miles, the surface of which is distributed among the component political divisions as follows:

	Square Miles
Prince Edward Island.....	2,184
Nova Scotia.....	21,428
New Brunswick.....	27,985
Quebec.....	706,834
Ontario.....	407,262
Manitoba.....	251,332
British Columbia.....	355,855
Saskatchewan.....	251,700
Alberta.....	255,285
Yukon.....	207,076
Northwest Territories.....	1,242,224
Total.....	3,729,665

The area under water, included in this total area, embraces 125,756 square miles. This includes the portions of the Great Lakes within the territorial limits of Canada.

The most northerly point of the domain is probably Cape Columbia, in Grant Land. The most westerly boundary is formed by the 141st meridian of west longitude. The population of the Dominion was 8,772,631 according to the census of 1921.

The Dominion has an exceedingly well-developed coast line, the southern sections of which are available to navigation. Commodious natural harbors exist in the coastal archipelago between Queen Charlotte and Vancouver islands on the west as well as in the broad gulf of the

St. Lawrence and the indented border of Nova Scotia.

Topography. Canada may be likened to an immense plain sloping towards high level from east to west and northwest. It may be divided into three regions: 1. The hilly, diversified eastern half, consisting of the Laurentian plateau and the northern extension of the Alleghanies. 2. The elevated interior plains, comparatively level, and largely treeless, sloping gently northeast and north. 3. The mountain region, between the plains and the Pacific coast, which consists of the northern extension of the Rocky Mountains of the United States, their included plateaus, and of various coast ranges. Each of these prime features is divisible into certain large, natural subdivisions.

1. The eastern part of Canada has a broken or hilly surface of generally low elevation. The highest points of the coast of Labrador approach 8000 feet, but the interior of northern Quebec, or of the region west of Hudson Bay, does not exceed 1500 to 3000 feet, and slopes steadily to the level of the shores of Hudson Bay. This whole vast region, embracing the Bay and continuing in a broad margin around it, is a succession of low, often bare or thinly forested ridges of hard rocks, between which are innumerable lakes, swamps ("muskegs"), and torrential rivers. Its recent release from universal glaciation, and the unfavorable climate, have not permitted much valuable soil to accumulate, except in small, isolated areas, and the region is not adapted to any considerable human habitation. Many large rivers flow into Hudson Bay from the east; some shorter, but copious, ones from the south, of which the Moose and Abitibi form canoe routes to James Bay; while the Albany River forms a canoe route from the Lake of the Woods region to the same inlet. In the west the drainage into Hudson Bay includes the whole basin of the Red, Saskatchewan, Churchill, and other rivers, thus embracing the southern half of the interior plains area; but this will be spoken of later. The Hudson Bay basin is defined south and southeast by a scarcely perceptible watershed, which is called "the height of land," and which divides the heads of the streams flowing northward from those draining southward into the St. Lawrence. This very ancient river valley, which includes the whole system of the Great Lakes (partly within the United States), is over 2000 miles long and forms the drainage outlet for an area of about 500,000 square miles. The surface of the St. Lawrence valley is broken in places by intrusive igneous rocks, which remain standing above the surface in such abrupt heights as Mount Royal, at Montreal, and the picturesque *buttes* south of that city.

Another topographic feature in this region is the Niagara Escarpment, the eastern edge of a plateau over the brink of which the waters of Lake Erie are poured into Niagara Falls (q.v.). As the escarpment is traced northward, it becomes more lofty, rising into high, rocky hills, which form the backbone of the triangular, very picturesque extension of land separating Lake Huron from Georgian Bay. The valley of the St. Lawrence narrows towards its mouth, where the northeastern extension of the Appalachians forms the mountainous Gaspé Peninsula. South of this lies the distinct region of the Maritime Provinces, whose features are largely similar to those of New England.

See NEW BRUNSWICK; NOVA SCOTIA; PRINCE EDWARD ISLAND.

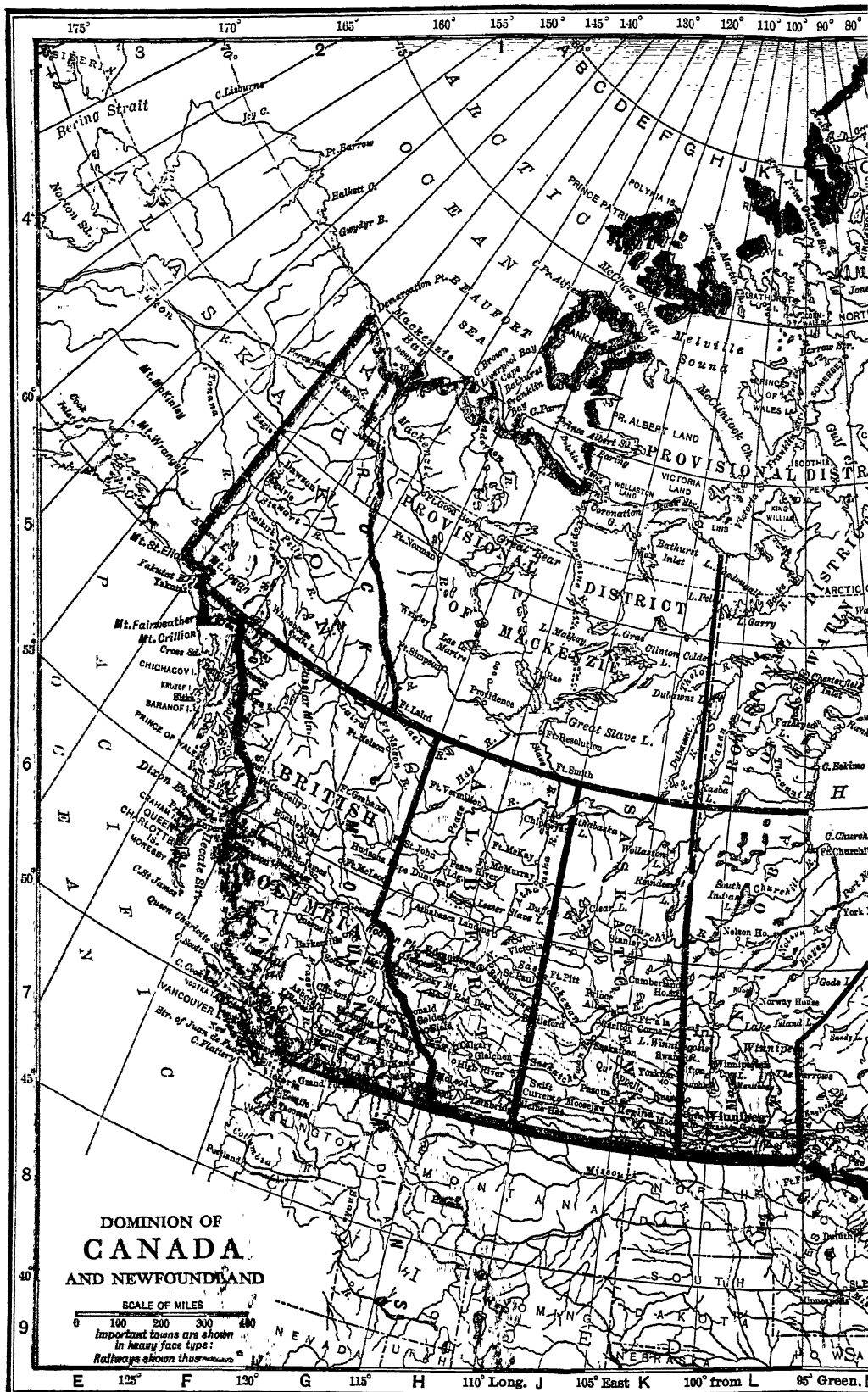
2. The second great division of Canada—the Interior Plains—comprises the area, some 700 miles in breadth, which continues the plains of the United States northward to the shores of the Arctic Sea, between Hudson Bay and the Rocky Mountains. This region is, however, more broken, well watered, and has more forest than the high, open plateaus southward, and is lower, constantly diminishing in altitude northward, the international boundary (lat. 49° N.) nearly coinciding with the watershed between the drainage into the Gulf of Mexico and that into Hudson Bay. Referring to this Canadian plains region, George M. Dawson, former director of the Geological Survey of Canada, wrote:

"The whole interior region of the continent slopes gradually eastward from the elevated plains lying near the base of the Rocky Mountains to the foot of the Laurentian Highlands, and, though the inclination is more abrupt in approaching the mountains, it is not so much so as to attract special attention. Between the fifty-fourth and forty-ninth degrees of latitude, however, along the lines which are in a general way parallel and hold a northwest and southeast course across the plains, very remarkable step-like rises occur. These escarpments form the eastern boundaries of the two higher prairie plateaus, and the most eastern of them overlooks the lowest prairie level, or that of the Red River valley. The three prairie steppes thus outlined differ much in age and character, and have been impressed on the soft formations of the plains by the action of subaerial denudation of former great lakes and probably also of the sea. . . . The actual increase of elevation accounted for in the two escarpments, however, is slight compared with that due to the uniform eastward slope of the plains. The direction of greatest inclination is towards the northeast, and a line drawn from the intersection of the forty-ninth parallel and the mountains to a point on the first prairie level north of Lake Winnipeg will be found to cross the escarpments nearly at right angles, and to have an average slope of 5.38 feet to the mile. From the same initial point, in a due east line to the lowest part of the valley of the Red River, a distance of 750 miles, the plains have an average slope of 4.48 feet per mile. . . . Northwest of the North Saskatchewan no extensive treeless plains occur in the central region of the continent, and the forest country of the east forms a wide, unbroken connection with that of the northern portion of British Columbia."

Along the edge of the lowest or easternmost of these levels lies that series of great lakes—Manitoba, Winnipeg, Winnipegosis, Reindeer, La Hache, and many other lesser ones—which form so striking a feature on the map, and empty by large, rapid rivers into Hudson Bay. Down from lakes on the second level flow such large rivers as the English, or Churchill, and Dubawnt, carrying to the northern part of Hudson Bay some overflow from Lake Athabaska; while from the foot of the Rocky Mountains, gathering the drainage of all three plains levels, comes the great Saskatchewan, in two branches, the North and the South, to enter Lake Winnipeg (which also receives from the south the large Red-Assiniboine affluent), and thence to flow through Nelson River to Hudson Bay. North of the North

Saskatchewan, on about the 55th parallel of north latitude, a line of rocky and forested highlands forms a watershed between its valley and that of the outflow towards the north. This begins with the great Athabaska and Peace rivers, which pass eastward from the base of the Rockies through a rough region to Athabaska Lake, and thence enlarged (as the Slave River) to Great Slave Lake, which also receives the powerful Liard from the west. This lake narrows westwardly into the Mackenzie, which flows north-westward to the Arctic Ocean, about 120 miles east of the border of Alaska. This great river is the equal of the Missouri in length, but discharges more water than does that stream, and is comparable to the mighty watercourses of Siberia. Its course lies near the base of the Rocky Mountains, west of which lie the head streams of the Yukon (q.v.), all of which are within Canadian territory. East of the Mackenzie, halfway between Great Slave Lake and the Arctic coast, lies the extensive Great Bear Lake, a feeder for the Mackenzie. Here the country is low, and a part of this lake's waters escapes into Coronation Bay by way of the Coppermine River. East of the head of the Coppermine a low divide turns the waters east of it into the Great Fish or Backs River, which flows through the desolate wastes, called the Barren Grounds, that lie between Hudson Bay and the Arctic Ocean (Victoria Strait), and empties into the latter at Elliot Bay. Of all these rivers, the greatest is the Mackenzie, but the most important are the Saskatchewan and the Red, for they have made available a wide area of habitable and valuable land. The Saskatchewan collects a large part of the waters of the provinces of Alberta and Saskatchewan, by the two main channels, each some 300 miles in length, and then flows 200 miles more to Lake Winnipeg. This lake also receives, besides the Red River and its tributary, the Assiniboine (which drains all southern Manitoba and much of North Dakota and Minnesota), the Winnipeg River, and the lakes Manitoba, Dauphin, and Winnipegosis, which together equal or exceed the bulk of Lake Erie. Lake Winnipeg itself is nearly as spacious as Lake Huron, and pours its waters through the great Nelson River, a series of rapids descending to Hudson Bay. The Saskatchewan and Red rivers were the former avenues of travel, and their valleys are now the seat of the principal population and industry in the Northwest.

3. The mountainous western border of Canada consists of a belt of snowy ranges from 500 to 600 miles in width. On the east are the Rocky Mountains, continuous with those of Montana, which consist of gigantic uplifts and foldings of the strata. Hence the scenery presents series of vast bedded cliffs, and weatherworn, jagged summits, instead of the rounded domes and slopes familiar in the southern Rockies. The ranges run northwest in approximately parallel lines, which are capped with snow and glaciers. This is due to their high latitude rather than to altitude, since there are but few peaks that exceed 11,000 feet, except between lat. 52° and 53°, where a number of peaks have recently been described whose elevations appear to exceed 13,000 and 14,000 feet. Mounts Robson, Columbia, Forbes, Bryce, Alberta, and Freshfield are seemingly the highest. A somewhat distinctive range west of the first is the Selkirk, in which are the headwaters of the



Columbia River, and which carries the Great or Illecillewaet Glacier. Then comes the Gold or Columbia Range, while farther west lies a broad, elevated plateau valley, drained by the Thompson and Fraser rivers and forming the centre of British Columbia. Between this valley and the Pacific coast extends a belt of intricate coast ranges, which northward form the boundary mountains between Canada and Alaska, and whose outermost summits constitute the line of islands—Vancouver, Queen Charlotte, and the Alexander Archipelago—which characterize that coast. (See *BRITISH COLUMBIA; ALASKA.*) It is through these coast ranges that the Fraser River (about equal to the Ohio) cuts its way in a series of magnificent cañons. These orographic features have had a very important bearing on both the climate and the economic value of this part of the country.

Climate and Soil. On account of the continental size of the country it is difficult to generalize in regard to the Canadian climate. Canada's southernmost latitude is the same as that of Constantinople, and its northernmost is the North Pole. It stretches westward from the Atlantic, where it has a coast line of 10,000 miles, to the Pacific, where its coast line is studded with islands and attains an almost equal length by reason of the deep indentations. Its climate ranges from the cold frigid zone of its northern part to the temperate zone which leads to its southern border, and from the mildness of its western coast to the cold of its eastern seaboard. The Canadian range of production extends from the staple corn and peach crops of the most southerly parts of the country to the hardier grains and vegetables far north, until vegetation dies out on the shores of the Arctic Ocean. In the northeastern region, the "Hudson Bay Country," the characteristics are Arctic or sub-Arctic—a brief, warm summer and a long, cold winter, with much fog at all seasons on the icebound coast. The current of cold water flowing down that coast past Greenland keeps the entrance to Hudson Bay frozen nearly two-thirds of the year, and often packs ice along the coast of Labrador so persistently as to make it inaccessible until midsummer; while the region of the Gulf of Newfoundland abounds in fog, and the air of New Brunswick and Nova Scotia is surprisingly cool, with much rain and snow. In the northern interior dry and severe cold prevails over half of the year, the mercury, even as far south as Manitoba, frequently dropping to 50° below zero of the Fahrenheit scale. The climate of the St. Lawrence valley, however, is excellent—cold, dry, and bracing, with much snow and occasional severe cold in winter, and in summer heat without much moisture, but usually an abundance of rain for crops, which are also nourished by the moisture given to the ground by the plentiful snow. In the Maritime Provinces the neighborhood of the ocean modifies the extremes both of winter cold and summer heat, but causes more rain and fog. As for soil, north of the Laurentian Hills, and through the Hudson Bay and northern Quebec regions, it is scanty, and little except garden vegetables can be grown, because of the liability to summer frosts. In the valley of the St. Lawrence, however, a belt of alluvial lowland near the river is extremely fertile; and the whole of southern Ontario, by reason of its moderate climate and varied soils, largely the result of glacial deposits, is exceed-

ingly well adapted to agriculture in all its phases and to the raising of all the hardier fruits. The grain crops and apples of Ontario are famous. In northern Ontario the winters are severe; nevertheless, about 24,500 square miles of land are admirably fitted for cultivation; but when the plains of Manitoba are reached, highly favorable conditions for agriculture are encountered. The provinces of Alberta and Saskatchewan are also renowned for the fertility of their soil. New areas are constantly given up to settlement by the government. One of the recent additions to the cultivated area of the Dominion is the Peace River district in Alberta, where 1420 square miles of excellent agricultural land have been thrown open by the Canadian government in the valley of the Peace River. Edson, on the Grand Trunk Pacific Railway, is the nearest station to this new farming region. The soil of the Red River valley, including the valleys of the Assiniboine and Souris (Mouse), is a deep black prairie loam of the highest fertility. The same may be said of the whole plains region, even on the high western steppes, where only water is needed to insure great productivity, and of all the valleys of British Columbia and its coast.

The climate of the more southerly, habitable part of the Canadian Northwest is much more favorable to life than one would suppose from a knowledge of its latitude merely. The isotherm of 65° F. mean summer heat, which is that of the St. Lawrence valley at Quebec, curves northward along the south shore of Lake Superior and through Manitoba to northern Alberta. This increase of warmth westward and northward, as the mountains are approached, is due to the effect of the mountains upon the prevailing air currents. There, as elsewhere, the usual winds blow from the west, and come to the coast expanded and saturated with warmth and moisture, after flowing for thousands of miles across the Pacific, whose waters are 20° warmer than are those of the North Atlantic. Vancouver Island and the coast of British Columbia have a climate, in consequence, much like that of the south of England, but warmer and even more moist. Flowers bloom in the gardens the year round, and fruit reaches the utmost excellence. Warmth and rainfall are derived from the latent heat and absorb moisture set free by condensation of the oceanic air against the high and cold Coast Range. Robbed of only a portion of their burden, but lifted and rarefied by elevation, the winds sweep across the interior valley of British Columbia and strike against the snowy Rockies, to deposit more rain or snow, but rain so rarely falls on the intervening Fraser-Thompson valley that agriculture there must depend upon irrigation. The reason for this is that the ever-ascending heat of the sun-baked plains buoys up the higher air currents and lifts them straight across to the Selkirks and eastern Rockies, to whose vast snow fields they give almost all of the moisture yet remaining. These once warm winds are now, however, cool winds, because they have become dry and rarefied. The eastern side of the Canadian Rocky Mountains has little snow and is sparsely provided with trees, as compared with its western side, or with the coast ranges, and the general temperature is cooler; yet the eastern foothills of the Rockies have a milder climate and earlier spring than the western, or than is enjoyed by Manitoba. This is due to the phenomenon called the chinook, which is a wind caused by the rarefied air rush-

ing down from the summits, necessarily increasing in density by compression as it strikes the plains level, absorbing moisture and giving up its latent heat to the extent of about 23° F. The chinook is not a wind that has come warm from the Pacific, but is of local origin. In summer the same breeze seems cool in comparison with the fierce radiation of the baked plains, but it is equally a chinook. (See CHINOOK WIND.) The genial influence of this warm, dry wind is seen in winter in the quick evaporation of the snow and the consequent exposure of pasturage to stock, and in producing early conditions of spring. On Peace River the winters are milder than those of Manitoba or Ontario, and everything that will grow near Toronto will ripen at Dunvegan, 13° of latitude north of it—the same latitude as the middle of Labrador. Its influence wanes with distance eastward, however, and Manitoba is subject to the extremes of its position at a high latitude in the centre of a continent, being subject to excessive noonday heats in summer and excessive cold in winter, with the nights always cool and the autumnal frosts liable to begin in August. In the extreme north a rigorous Arctic climate prevails, with the winter temperature descending to -75° F. The summers are, however, still favorable to plant growth. The whole Northwest, however, is healthful in a high degree.

Flora. The flora of all the northern part of Canada is Arctic and sub-Arctic, and this characterizes the scanty growth in the eastern part all the way down to the height of land which separates the basin of Hudson Bay from the St. Lawrence valley. A great space between Hudson Bay and the Arctic shores is almost a desert, and has been known from the earliest times as the Barren Grounds, or Tundra, yielding hardly anything more than mosses, lichens, and a few willows and hardy herbs. The flora of the St. Lawrence valley and of the Maritime Provinces differs little from that of the northeastern United States, the whole of that space having been originally covered with mixed forests of large and valuable trees, both coniferous and hard wood. The western plains are comparatively treeless as far north as the Saskatchewan, yet are covered with prairie grasses and herbage, which thin out towards the higher and drier steppes westward, where the plains are covered with the bunch grasses which once supported enormous herds of buffaloes and antelopes and now furnish sustenance for a rich stock-raising region. North of the Saskatchewan a broad belt of rather small and sparse trees extends from Hudson Bay to Great Slave Lake and the Rocky Mountains—chiefly spruce, tamarack, and poplar. The dry western slopes and valleys of the Rocky Mountains are thinly covered with woods, mainly pine; but the forest increases in density and the trees in size as one proceeds west towards the region of greater rainfall; and after passing the treeless Fraser-Thompson valley, the coast ranges, and especially their western slopes, are found covered with the dense forests of mighty evergreen trees that characterize the northwest coast of all North America. The principal trees are the Douglas spruce, or "Oregon pine" (*Pseudotsuga*); the white cedar (*Thuja*); a hemlock (*Tsuga mertensiana*), and Engelmann's spruce (*Picea engelmannii*). These coast forests are inconceivably dense and sombre, and their average height on the lowlands is not less than 200 feet, while the

Douglas spruces often exceed 300 feet, and the cedars are hardly less tall.

Fauna. The animals of Canada are as varied as its flora and characteristic of northern latitudes. All bear a close resemblance to those of northern Europe and Asia, and many species are identical, i.e., have a circumpolar range. (See AMERICA, *Fauna*.) The carnivora are represented by several species of the weasel family (such as the ermine, sable, fisher, wolverine, mink), whose abundance and value long ago gave the name "Fur Countries" to northern Canada. There are also the lynx, bear, fox, wolf, skunk, and in the Northwest the badger. The puma, or American lion, is still found in some parts. Among the rodents the beaver is so widespread and characteristic, and was so important to the beginnings of colonial civilization, that it became the national emblem of the Dominion. The Canadian porcupine, muskrat (locally called "musquash"), hares, and many smaller rodents are numerous, and on the western plains are a variety of burrowing "gophers" and the like. The Virginian and black-tailed deer enter the southern edge of Canada, and the elk is found in the Rocky Mountains, but the moose and various caribou range all over British North America; and in the mountains of British Columbia the wild sheep and the white goat antelope are numerous and highly characteristic. The pronghorn antelope is still abundant in some parts of the Saskatchewan valley, and the musk ox is found in the Arctic tracts. There is an immense variety of birds, many of which, characteristic of northern climates, are unknown southward; but the majority are migrants that go to the northern parts of Canada to breed and leave the country in the winter for warmer regions southward. Fishes are numerous in all the inland waters and about all the coasts (see *Fisheries*, below), but reptiles and the more delicate insects are scarce, except in the most southerly part. The gathering of furs, which played so striking a part in the colonization and earlier prosperity of the country, has been greatly diminished of late, owing to the extinction of the principal fur-bearing animals over a large part of their former range. The beaver, in particular, has disappeared from all but the remotest and wildest regions. The game animals are hunted by large numbers of sportsmen, and, in spite of protective laws, the supply of game is diminishing.

Geology. The most ancient rocks found in Canada, and in North America as well, are the granites, gneisses, and schists which underlie a great V-shaped area, having Hudson Bay in the centre, and extending from the Great Lakes northeast to the Labrador coast and northwest to the shores of the Arctic Sea. This area was once diversified by mountains, which are represented at the present time, after an immeasurably long period of erosion, by the Laurentian plateau. The age of the granites and banded rocks is Archæan. On the borders of this primitive land area stratified beds have been deposited during all the succeeding geological periods. The Cambrian and Silurian systems are represented by great thicknesses of strata that outcrop in Nova Scotia, New Brunswick, Newfoundland, along the St. Lawrence valley, and on the shores of Lake Ontario. They also appear farther west in Manitoba, extending thence in a northwesterly direction towards the Arctic regions and into British Columbia. The Devonian system is less

extensively developed in the eastern provinces, but it constitutes a wide belt in the prairie regions which border the Cambrian and Silurian strata. Between this Devonian belt and the eastern Rocky Mountains the surface is formed by Cretaceous and Tertiary beds that are a part of the great series reaching northward from Texas across the United States. The Rocky Mountains of Canada are similar in structure to the mountains of Colorado, Wyoming, and Montana, and have been built up by upheaval and folding of sediments, and, to a lesser extent, by volcanic action. The strata of which they are composed range in age from Paleozoic to Tertiary, while in the Selkirk even the Archæan may be present. The Carboniferous system is not especially important in respect to area, but it contains the valuable coal deposits of Nova Scotia and New Brunswick, and is known to occur also in the central prairie region, in British Columbia, and along the Arctic coast. The coal beds of Vancouver Island and those found in the Rocky Mountains are of Cretaceous and Tertiary age. In recent geological times nearly the entire area of Canada was covered by an ice sheet, the Laurentian glacier, that terminated in the northern United States. The surface features were profoundly modified by the erosive action of this vast mass of moving ice, as is evidenced by the numerous great lakes and by the extensive deposits of sands, gravels, and clays that rest upon the older geological formations. See also *Geology*, under BRITISH COLUMBIA; ONTARIO; ETC.

Resources. The following brief résumé of Canada's immense and extremely diversified natural resources is followed by detailed information and statistics under various headings. Adverse climate and distance have prevented the development of these resources until recent years, when man's growing ability to cope with natural disadvantages enabled Canadians to begin reaping the benefits accruing from the exploitation of the surface and subsoil of the Dominion. The vast expanses of the frigid zone provide favorable hunting grounds, notwithstanding the rigors of long wintry seasons. Within this area minerals are also found in abundance. Large deposits of bituminous coal are known in the Arctic islands. This frozen area is succeeded on the south by an arid belt. This section, although unavailable for agriculture, affords excellent grazing fields which may constitute the seat of a thriving cattle industry. The prairie zone which follows again to the south is a somewhat more propitious area for farming, although its climate varies abruptly between extremes of cold and heat. Farther south is a rich though not continuous culture belt, comprising the river valleys of southern British Columbia and, excepting the barren strip around Lake Superior, extending through southern Manitoba to the Atlantic coast. This is the part of Canada which is best developed. Owing to its fertility it has become an important wheat belt. Transportation to markets on the east is facilitated by the far inland penetration of the Great Lakes—St. Lawrence basin. On the west the Pacific seaboard affords an outlet for British Columbia's products.

The culture of cereals has progressed rapidly in this favored belt. Wheat is the chief crop in southern Ontario, Manitoba, and Saskatchewan. Oats are cultivated in all southeastern Canada, corn and barley in southern Ontario principally,

vegetables and fruits in the southern districts of Ontario and British Columbia.

Canada's forests constitute another source of the country's wealth. It is estimated that the forest area of Canada includes between 500,000,000 and 600,000,000 acres of land and that between 300,000,000 and 400,000,000 acres contain timber of commercial size. The lumber industry has been developed mainly in the basin of the Ottawa River. The most important Canadian wood is spruce. Pine, fir, maple, beech, poplar, and elm are among the varieties exploited.

The Dominion's cattle industry is susceptible of large development. The eastern districts of the Rocky Mountains area contain vast stretches where sheep are known to thrive. The country's wool production, which is at present insignificant, may eventually assume considerable proportions.

Mining is also an important source of wealth. Coal resources are abundant. The fuel is found in British Columbia, in Alberta, and in the Maritime Provinces. The reserves of bituminous and lignitic varieties are considerable. Gold, silver, copper, and lead are widely distributed. The Klondike is noted for its gold production. Silver lead is found in the Selkirk. Copper deposits have been found in the Klondike. Iron is found in large quantities in Nova Scotia, Quebec, Ontario, and Vancouver Island. Oil is known in the Great Lakes district.

Fishing is one of the great Canadian industries. It may be said that the world's most extensive fisheries are found in Canada. The industry provides sustenance for many of the inhabitants of Nova Scotia, New Brunswick, Quebec, and British Columbia. Over 91,000 persons are engaged in it. Cod, salmon, and herring are the chief products. Lobsters, mackerel, sardines, and haddock are also caught in Canadian waters. The numerous islands and bays of British Columbia and the deeply indented coast line of the Atlantic from the Bay of Fundy to the Strait of Belle Isle provide excellent fishing grounds. Both deep-sea and coastal fishing are pursued on the Atlantic coast, where the waters overlying the banks found within 100 miles from the Canadian coast are well stocked with various species.

Fur farming has been developed in Canada in recent years, and the industry has progressed rapidly, owing to the high prices which pelts command in the world's markets. Foxes, skunks, minks, raccoons, fishers, beavers, and muskrats are bred on the farms. The domestication of fur-bearing animals has been carried on mainly in the Maritime Provinces, although it is also undertaken in Ontario and Quebec and to a lesser extent in the western provinces. The northeastern portion of the Province of Quebec, formerly known as Ungava, is the last great reserve of fur-bearing animals in North America.

The question of the conservation of Canada's natural resources became urgent chiefly in connection with the development of the forests and fisheries. The result was the appointment of the Commission of Conservation, whose office is at Ottawa. It has a general chairman and also chairmen of committees specially organized to conserve various resources. The committees are those on: *Fisheries, Game, and Fur-Bearing Animals; Forests; Lands; Minerals; Press and Coöperating Organizations; Public Health; Water and Water Powers.*

Mineral Resources and Mining. Canada was long supposed to possess great mineral wealth, but only in recent years have the great variety, extent, and richness of its mineral resources been ascertained. The geological provinces which have been so productive of mineral wealth in the United States, viz., the Appalachians in the east, the Cordilleras in the west, and the Lake Superior region between the two, extend northward into Canada. A combination of adverse circumstances, however, has prevented the extensive development of the mining industry; among these are the sparse population, its dispersion over a very wide area, the isolation of the mining lands, and the lack of means of transportation. In addition to this is the severity of the climate. Moreover, the coal supply, so necessary in the smelting of metallic ores, while present in enormous deposits, is located at the two extremes of the country (Nova Scotia and British Columbia), leaving the middle region at a great disadvantage. That these disadvantages will not permanently check the development of the industry, however, has been clearly demonstrated by its steady growth. The mineral product of 1904 amounted to (approximately) \$60,082,771, and in 1912 its total value had increased to \$135,048,296, a growth of \$31,827,302 over the year 1911. The production per capita in 1912 was \$18.27.

Gold has long been mined in moderate quantities in Nova Scotia, where it is found in the quartzites and slates of the Cambrian rocks, but larger quantities were secured from the placer mines of British Columbia, in which work began about 1857, and whose output by 1863 had reached an annual value of \$3,913,000, but subsequently declined until in 1893 it reached its lowest point, \$356,131. The great revival of the industry came in 1897, when the placer mines of the Klondike and other Yukon regions were opened, the Yukon alone reaching \$22,275,000 in 1900. But the gold production of the Yukon district fell steadily until 1907, when it was only \$3,150,000, the figure for 1904 being (approximately) \$10,500,000. Then production began to rise again, and in 1912 amounted to 267,447 ounces, valued at \$5,549,296; the total value of gold produced in 1912 being \$12,559,443. (See YUKON GOLD FIELD.) Quartz and hydraulic mining has been undertaken in southern British Columbia (the Kootenay region) with a decided increase in the output. Gold exists at other points, notably on the north shore of Lake Superior, but mining operations there are still on a small scale.

Another decided increase is that of **coal**, which ranks next to gold in value of output. It more than doubled itself in the period between 1892 and 1904, and again by 1911, when the amount produced was 11,323,388 tons, valued at \$26,467,646. The greatest production was in 1912, when 14,699,953 tons were mined, valued at \$36,349,299. Of this, Nova Scotia produced about five-sevenths and British Columbia the greater part of the remainder, the main production in the latter province being on Vancouver Island. Most of the coal of British Columbia and Nova Scotia is bituminous, of good quality, while the vast fields of the interior plain, extending from southwestern Manitoba westward to the mountains, contain rich deposits of serviceable lignite, and anthracite is found on Queen Charlotte Island and near Calgary, Alberta. In 1906 extensive beds of anthracite

coal were discovered on the Hudson Bay slope in the neighborhood of the Albany River. In 1912 the production of coal had so increased in Alberta that its total was 3,446,349 tons against 3,220,899 tons in British Columbia. The production in Nova Scotia was but a little more than one-half of the total, being 7,791,440 tons out of a total production of 14,699,953 tons.

The **copper** product increased in value from \$818,000 in 1892 to approximately \$5,510,000 in 1904, most of it being mined in British Columbia and Ontario, and smaller quantities in Quebec. The value of the copper production had so increased in 1912 that it was more than double the production in 1904, it having reached a total of \$12,709,311. In British Columbia it is found in combination with gold and silver and is mined chiefly as a by-product. None of the Canadian copper ore is refined in Canada, but the ore matte is shipped into the United States for that purpose.

Silver and lead have likewise greatly increased. The value of the output of the former in 1892 was \$272,000, and by 1904 was increased by \$1,845,000; that of the latter was \$33,000, and increased by \$1,604,000 in the same period. In 1912 the value of silver was \$19,440,165, and lead \$1,597,554. Ontario produces the greater portion of silver. In British Columbia the two metals are united in the same ore, which is found in the clay schists and intrusive granites occurring in the Kootenay region.

Canada holds a position of special advantage in the production of two minerals, **nickel** and **asbestos**, having excelled her only rival (New Caledonia) in the production of the former, and having the field almost wholly to herself in the production of the latter. The nickel is mined in the Sudbury district, northeast of Lake Huron, where mining began in 1888, and in 1891 the output amounted to \$2,700,000, after which it decreased until 1900, when it rose to \$3,327,000. The highest point attained by this industry was in 1912, when the product amounted to \$13,452,463. The asbestos is mined in the eastern townships of Quebec, where it is found in veins which run through rocks of massive serpentine; the annual output has increased from \$390,000 worth in 1892 to \$2,979,384 in 1912.

Iron is perhaps the most widely distributed mineral, being found in every province, but its utilization has suffered from the lack of coal for smelting purposes and from the prohibitive tariffs of the United States. The Dominion government and also the government of Ontario has placed a bounty upon pig iron, which has stimulated its production, the value of the product exceeding \$1,212,000 in 1901, but falling in 1904 to approximately \$901,000. In 1912 the "pig iron from Canadian ore" was valued at \$450,886, and iron ore exports were valued at \$382,005. The total value of pig iron produced in 1912 was \$14,550,000, mostly from foreign ore. The prospects for the development of iron mining are greatest in Nova Scotia, inasmuch as coal and limestone are there found in close proximity to the iron ore.

The production of **petroleum** and of **salt** in the peninsular part of Ontario has long constituted well-established industries: the value of petroleum products in 1912 was \$345,050, and of salt about \$459,582. Natural gas is also found in this region, and in 1912 the value was \$2,311,126.

The production of the less important minerals in 1912 was as follows: corundum, \$239,091;

graphite, \$117,122; zinc ore, \$215,149; gypsum, \$1,320,883; mica, \$143,976; and pyrites, \$314,085. The production of cement in 1912 was valued at \$9,083,216. The value in 1912 of the granite limestone, marble, and sandstone quarried was \$4,675,851. There are enormous resources in the way of building stone and clays, which are extensively drawn upon. While the future holds in prospect an increasingly rapid exploitation of Canadian minerals, the supply is so great that the question of their final exhaustion scarcely presents itself, and the inhospitable Laurentian regions to the north will contain untouched hoards of wealth for centuries to come.

Fisheries. With oceans washing its shores on three sides, the Great Lakes, and numerous small lakes and rivers scattered throughout its domain, Canada has exceptional advantages for the development of the fishing industry. Naturally this was developed early, and in at least three of the four Maritime Provinces it has long ranked next to agriculture in importance. Later fishing became prominent in the lake waters adjoining Ontario, and still more recently in British Columbia and on Lake Winnipeg. The total value of the fish product had increased from \$6,577,000 in 1870 to \$17,714,000 in 1890, \$23,516,000 in 1904, and to \$34,667,872 in 1911-12. The gain has been almost wholly in the west, Nova Scotia leading the other provinces up to 1905, her yield having stood at about \$7,000,000 for a decade and a half. In 1911-12 Nova Scotia gave up her leadership to British Columbia. The following will show the value in 1911-12 of the fish products by provinces for those reporting over \$1,000,000: British Columbia, \$13,677,125; Nova Scotia, \$9,367,550; New Brunswick, \$4,886,157; Ontario, \$2,205,436; Quebec, \$1,868,136; Prince Edward Island, \$1,196,396; Manitoba, \$1,113,486. For 1911-12 the total value of the fish products marketed in Canada was \$34,667,872. Of this amount the sea fisheries contributed \$30,842,875 and the inland fisheries \$3,824,997. The values of the principal fish catches were: salmon, \$10,345,570; cod, \$4,201,760; lobster, \$4,790,203; halibut, \$2,278,824; herring, \$1,973,682. The total number of persons engaged in the industry is slowly increasing, having been 63,700 in 1890, 79,100 in 1903, and 91,132 in 1912. Of this number 65,926 were fishermen, 9056 in vessels and 56,870 in boats. The Dominion since 1882 has paid a bounty for deep-sea fisheries which amounts to nearly \$160,000 annually, almost two-thirds of which goes to Nova Scotia fishermen. In 1903, 25,230 men shared the bounty, and in 1912 the bounty was paid to 25,819 fishermen.

Of the east-coast fisheries, cod and lobster are the most important, each annually exceeding \$4,000,000 in value: the halibut catch exceeds \$2,000,000; the herring fisheries exceed \$1,500,000; and of a large variety of other kinds of fish the most important are mackerel, smelts, sardines, haddock, and hake. In the Great Lakes trout is the most important, followed by pickerel and pike. Whitefish leads in the lakes of Manitoba, and on the Pacific coast salmon is of greatest consequence. The seal fisheries have greatly declined, owing to the award after the Bering Sea Controversy (q.v.). In 1903, 20,496 seal skins (valued at \$307,400) were taken, of which 3865 were from the coast waters of British Columbia and 8161 from the Bering Sea.

In 1911-12 the number of seal skins marketed was 16,444, valued at \$95,284. The best whale-fishing region in the world extends along the north coast, from the mouth of the Mackenzie to Labrador, and vessels from many nations visit it annually. In 1911-12 the number of whales taken was 1244; value, \$391,200. The fishing industry is wisely guarded by the government, through the Minister of Marine and Fisheries. Artificial pisciculture is carried on in 44 hatcheries. There are also 3 sub-hatcheries and 5 retaining pounds for Atlantic salmon. The capital invested in fisheries in 1912 was nearly \$21,000,000.

Agriculture. Dating from the earliest permanent settlement, agriculture has stood pre-eminent among the Canadian industries, and 45 per cent of the population secures its livelihood directly from the soil. The fertile lands of the Maritime and St. Lawrence provinces were early brought under cultivation. On the other hand, the vast productive plains of the far west, owing to their isolation and their real and supposed inclemencies of climate, have only recently been utilized. A large portion of the fertile lands of southern Manitoba were taken up at the close of the nineteenth century, and the occupation and cultivation of the region farther west, now comprised in the provinces of Saskatchewan and Alberta, progress as it is made accessible by the construction of railroads. The practicability of agriculture in this section has been clearly demonstrated, the climatic conditions not being so unfavorable as they were formerly represented. It is only in the northern portions of the plains that the growing crop is endangered by summer frosts. And, though the rainfall is scant, it occurs during the growing spring months, and it is generally adequate for the needs of the crops. The driest portion of the plain is on the western border, but much of this is irrigable and even in its natural state is well adapted to grazing. The government exercises a close supervision over irrigation, and there are several hundreds of miles of ditches and canals.

The Alberta Railway and Irrigation Company holds water rights on the St. Mary, Milk, and Pelly rivers, and has constructed a canal with a capacity of 800 second feet, taking water from the St. Mary River near Cardston, Alberta. It has completed or under construction a system of canals and distributaries aggregating some 25 miles. Much of the work is of a very substantial character and represents an expenditure of some \$1,250,000. At the present time (1914) nearly 100,000 acres are actually irrigated by this system, but when fully developed at least 350,000 acres will be provided with irrigation.

The project of the Canadian Pacific Railway is the largest scheme in Canada. The tract to be irrigated contains some 3,000,000 acres along the main line of the company's railway between Calgary and Medicine Hat, chiefly north of the line. The soil is productive and easily worked, and much of it is well adapted to irrigated farming. Surveys so far indicate that about one-third of the whole tract, or 1,000,000 acres, can be irrigated. For administrative purposes the tract has been divided by north and south lines into three sections of about equal area. For the western and central sections water is taken from Bow River at Calgary. For the eastern section a dam is now (1914) under construction in the Bow River near "Horseshoe

Bend" in the vicinity of Bassano. A fairly complete system of canals and reservoirs has been built in the western section, and the system is being rapidly extended in the central section. From the Great Lakes eastward to the Atlantic the agricultural area is limited only by surface conditions, the climate being very favorable. There is in this area much hilly and broken territory which does not lend itself readily to profitable cultivation. But throughout a large portion of northern Canada, including the greater portion of the Laurentian region, the climatic conditions will never admit of agricultural development. See CLIMATE.

The districts in which agriculture has developed most are Prince Edward Island, the protected valleys of the Annapolis in Nova Scotia and the St. John in New Brunswick, the narrow valley of the St. Lawrence above Quebec City, peninsular Ontario, the Red River valley in Manitoba, and the plains of the Saskatchewan and Athabasca rivers in the provinces of Alberta and Saskatchewan.

In 1911 Saskatchewan, Manitoba, and Ontario were the leading agricultural provinces. Saskatchewan led in the acreage and production of wheat, with 4,704,660 acres and 97,962,000 bushels. Manitoba was second, with 2,979,734 acres and 60,275,000 bushels. The production of oats, in which Ontario had always led, changed in 1911, when, although Ontario had 2,699,230 acres, her yield of 84,829,000 bushels was less by nearly 13,000,000 bushels than that of Saskatchewan, with 2,124,057 acres and 97,665,000 bushels.

Manitoba led in the production of barley, with 433,067 acres, producing 14,477,000 bushels. The total production of barley in 1911 was 40,641,000 bushels, of which Manitoba, Saskatchewan, and Alberta produced 24,043,000. The following table shows for 1911 the total yield of Canada in wheat, oats, and barley, compared with the yield of the three Northwest Provinces (Manitoba, Saskatchewan, and Alberta), both collectively and separately. This shows the tremendous strides of the three provinces in agriculture in a few years.

		Wheat	Oats	Barley
Canada.....	Bu. Acres	215,851,300 10,373,958	348,187,600 9,219,920	40,641,000 1,404,352
Northwest Provinces..	Bu. Acres	194,083,000 9,301,293	212,819,000 4,563,203	24,043,000 761,738
Manitoba....	Bu. Acres	60,275,000 2,979,734	57,893,000 1,260,736	14,447,000 433,067
Saskatchewan	Bu. Acres	97,665,000 4,704,660	97,962,000 2,124,057	5,445,000 172,253
Alberta.....	Bu. Acres	36,143,000 1,616,899	56,964,000 1,178,410	4,151,000 156,418

The Maritime Provinces, excepting Prince Edward Island, have never entered so extensively into agricultural pursuits, but have become well known for the production of certain crops. Potatoes and turnips receive great attention, and the yield and quality of the product are remarkable. The same is true of the apple crop of the Annapolis valley in Nova Scotia, and, to a less degree, of the St. John valley, New Brunswick. The annual shipments of apples from these provinces, together with those from Ontario and Quebec, are enormous. The Lake Erie coast of

Ontario, and especially that part of the Ontario peninsula between Lake Ontario and Lake Erie, commonly known as the Niagara Peninsula, has become noted for its peaches and grapes. It has been found that larger fruits do not thrive well on the western plains, but throughout the whole of southern Canada and well to the northward various kinds of smaller fruits, particularly berries, thrive abundantly. British Columbia, though not possessed of such large tracts of arable land as the other provinces, can still boast of its greater adaptability for fruit raising, and the production of oats, potatoes, roots, and hops is being extensively engaged in.

On many farms throughout agricultural Canada, particularly in Manitoba, wheat formerly constituted almost the only crop, but more recently there has been a growing tendency towards mixed farming and the raising of cattle and other stock. Canadian stock has a wide reputation for the purity of its breeds, and great care is taken to prevent deterioration. The raising of beef for the English market has long been an important source of revenue. Probably no phase of agricultural development in the east is so remarkable, however, as the dairy industry. In Ontario alone the creameries increased from 74 in 1893 to 265 in 1903, and during the same period the cheese factories increased from 897 to 1126. In 1910 there were in Ontario 1248 factories for the making of butter and cheese. In all the eastern provinces poultry raising is attended to, and the exportation of eggs is very large.

The Dominion government has established the Central Experimental Farm at Ottawa, and four branch farms, respectively at Nappan, N. S.; Brandon, Man.; Indian Head, Sask.; and Agassiz, B. C.; the practical help they render to the farmers, particularly in the direction of diversifying production, is very great. Similar branches known as "experimental stations" have been established at Charlottetown, P. E. I.; Kentville, N. S.; Cap Rouge, P. Q.; Ste. Anne de la Pocatière, P. Q.; Rosthern and Scott, Sask.; Lethbridge and Lacombe, Alta.; and Invermere and Sidney, B. C. The several provinces have encouraged agriculture by grants to societies and fairs, bonuses to creameries and cheese factories, and in various other ways. Scientific instruction in agriculture is provided at the Ontario Agricultural College, Guelph, and the Macdonald Institute at the same place; also at agricultural colleges at Truro, N. S., Winnipeg, Man., and at the Macdonald College at Ste. Anne de Bellevue, P. Q. The following statistical data on Canadian agriculture relate to the Dominion as a whole; for a detailed study of the provinces the reader is referred to the respective articles.

In 1912 the estimated area under field crops was 32,449,420 acres. This is slightly under the previous year, when the acreage was 32,853,074. The decrease was due to bad weather, many farmers being unable to sow their crops; 326,000 acres of fall wheat were destroyed by the severe winter of 1911-12. The decrease in value of crops from \$565,711,600 in 1911 to \$511,951,100 in 1912 was partly due to lower prices. From 1911 to 1912 the three Northwest Provinces (Manitoba, Saskatchewan, and Alberta) showed an increase of 350,697 acres under oats and 48,062 acres under barley, while the acreage under wheat decreased 339,493. The following tables show the area and yield of the

most important field crops for the whole of Canada in 1901 and 1911 and also a comparison in area and yield for the years 1911 and 1912.

Oats, barley, buckwheat, flaxseed, potatoes, turnips, fodder corn, sugar beets, and alfalfa showed an increase in yield, although in some cases the acreage had decreased.

A comparison of the census returns for the leading field products of Canada for 1901-11 will be found below:

	1901		1911	
	AREA Acres	YIELD Bushels	AREA Acres	YIELD Bushels
Wheat.....	4,224,542	55,572,368	10,373,958	215,815,300
Barley.....	871,800	22,224,366	1,404,352	40,641,000
Oats.....	5,367,655	151,497,407	9,219,920	348,187,600
Rye.....	176,679	2,316,793	142,571	2,694,400
Corn.....	360,758	25,875,919	316,104*	18,772,700*
Buckwheat.....	261,726	4,547,159	359,367	8,155,500
Peas.....	670,320	12,348,943	287,135	4,536,100
Potatoes....	448,743	55,362,635	459,097	66,023,000
Hay.....	6,543,423	7,852,731	7,903,242	12,694,000

* Does not include fodder corn.

The two census records show a tremendous increase in the yield and acreage of wheat, oats, buckwheat, and barley. Peas, on the other hand, shows a large decrease.

A comparison of the census returns of 1901 with those of 1911 shows that all the grains, with the exception of corn, increased in yield. Wheat increased 146 per cent in acreage and 288 per cent in product; barley increased 61 per cent and 83 per cent respectively; oats, 72 per cent and 129 per cent; rye decreased 19 per cent in acreage and increased 12 per cent in yield; and corn decreased 12 per cent in acreage and decreased 27 per cent in yield. Buckwheat, which decreased from 1891 to 1901, increased in the decade from 1901 to 1911 in both acreage and yield—37 per cent in the former and 79 per cent in the latter.

AREA AND YIELD OF PRINCIPAL FIELD CROPS OF CANADA,
1911-1912

	1911		1912	
	AREA Acres	YIELD Bushels	AREA Acres	YIELD Bushels
Wheat.....	10,373,958	215,851,300	9,758,400	199,236,000
Oats.....	9,219,920	348,187,600	9,216,900	361,733,000
Barley.....	1,404,352	40,641,000	1,415,200	44,014,000
Rye.....	142,571	2,694,400	136,110	2,594,000
Peas.....	287,135	4,536,100	250,820	3,773,500
Buckwheat....	359,367	8,155,500	387,000	10,193,000
Flaxseed.....	682,622	7,867,000	1,677,800	21,681,500
Beans.....	60,630	1,155,600	59,800	1,040,800
Corn.....	316,104	18,772,700	292,850	16,569,800
Potatoes.....	459,097	66,023,000	472,400	81,343,000
Turnips.....	227,141	84,933,000	217,400	87,505,000
Hay.....	7,903,242	12,694,000	7,633,600	11,189,000
Fodder corn...	285,321	2,577,200	278,740	2,858,900
Sugar beets...	20,878	177,000	19,000	204,000
Alfalfa.....	101,781	227,900	111,300	310,000

The area in field crops for Canada fell off from 1911 to 1912 in nearly every instance. There was a decrease in acreage of oats but an increase in yield; wheat, rye, peas, beans, corn, and hay decreased in both acreage and products.

The wealth of the Dominion in farm stock of all kinds is shown in the following table:

FARM STOCK

	1901	1911	1912
Horses.....	1,577,493	2,266,400	2,336,800
Cows (milk).....	*	2,876,600	2,890,100
Sheep.....	2,511,239	2,389,300	2,360,600
Swine.....	2,353,838	2,792,200	2,656,400
Other cattle.....	*5,576,411	4,210,000	4,093,600

* In 1901 all cattle, whether milk or other, were returned as cattle, no distinction being made until 1908.

In 1910 there were, according to the latest official returns available in 1913, in Canada 3625 butter and cheese factories and 11 factories for condensed milk and cream. The number of persons employed in these establishments was 6513, who made 64,698,165 pounds of butter, valued at \$15,645,845, 199,904,205 pounds of cheese, valued at \$21,587,124, and 27,831,596 pounds of condensed milk and cream, valued at \$1,814,871. The total value of all dairy industries for 1910 was \$39,047,840, an increase in the decade of 31.33 per cent. The average selling price of cheese in 1910 was 10.8 cents compared with 10.06 in 1900, and of butter 24.18 in 1910 compared with 20.08 in 1900.

Manufactures. The great abundance of natural resources in Canada, including raw manufacturing material, affords a good basis for the upbuilding of the manufacturing industry. Additional advantages come from the abundance of fuel, particularly in Nova Scotia, where coal is plentiful, and from the widespread facilities for procuring water and electrical power afforded by the numerous rapids and falls characteristic of Canadian rivers. In Ontario electrical power for manufacturing and lighting purposes is now distributed to various towns from power works at Niagara Falls. The extensive forests supply material for the manufacture of furniture, doors, sashes, and other wooden articles. The spruce forests furnish wood pulp for the manufacture of paper. The abundance of hemlock is of great importance, in view of the growing demand for it in the tanning trade. Leather is another article of growing importance. Boot and shoe manufacturing is carried on at Montreal, Quebec, and St. Hyacinthe, a large part of the labor being done by French-Canadian girls. Cottons are manufactured in Quebec and woollens in Ontario. The manufacture of iron and steel products is another rapidly developing branch of industry, most promising in Nova Scotia, because iron ore, coal, and limestone are there found in close proximity. At Winnipeg, Toronto, and a few other points pork packing is carried on, and fish-curing and canning establishments are most numerous in British Columbia. The following statistical data present the salient features of the census of manufactures taken in 1910, compared with those for 1900:

	1900	1910	Increase
Establishments...	14,650	19,218	4,568
Employees on salaries.....	30,691	44,077	13,386
Capital.....	\$448,916,487	\$1,247,583,609	\$800,667,122
Salaries.....	\$23,676,146	\$43,779,715	\$20,103,569
Employees on wages.....	308,482	471,126	162,644
Wages.....	\$89,573,204	\$197,228,701	\$107,655,497
Raw and partly manufactured materials.....	\$266,527,858	\$601,509,018	\$334,981,160
Value of products.....	\$481,053,375	\$1,165,975,639	\$684,922,264

The instructions for the census of manufactures of 1901 provided that no factory with less than five persons would be included, except butter and cheese factories and brick and tile works. But the same rule might have been applied to flour and grist mills and electric light plants, and in the census of 1911 the exceptions were extended to include the industries of flour and grist mills, saw and shingle mills, fish-curing plants, limekilns, and electric light and power plants. The merging of small industries continued, and though the number of establishments increased, the increase was not in proportion to the great increase in the value of products. The average value of products per establishment in 1900 was \$32,836, while in 1910 the average had grown to \$60,671.

As was stated above, the rule of the census of 1901 excluding industrial establishments with less than five employees did not apply to butter and cheese factories and to brick, tile, and pottery works. Including all of these, there were in Canada, in 1910, 19,218 establishments with a total capital of \$1,247,583,609 and a total product valued at \$1,165,975,639. The number of salaried officers, managers, salesmen, etc., was 44,077, of whom 6375 were women; and of wage earners, 471,126, of whom 462,725 were employed in the establishments and 8401 outside of them. Of the total number of wage earners working in establishments, 376,872 were men, 72,571 were women, and 13,276 were children under 16 years of age. In 1910 the average number of workers per establishment in the provinces were: British Columbia, 51; Manitoba, 39; Ontario, 30; Saskatchewan, 29; Quebec, 24; Alberta, 24; Prince Edward Island, 9; New Brunswick, 21; Nova Scotia, 19.

Compared with 1900, the most important branches of manufacture in Canada in 1910 were as follows:

working for wages in establishments, male, female, and children under 16; and the number, amount of wages, and average wage of piece workers outside of the establishments.

SALARIED OFFICERS

	MALE			FEMALE		
	No.	Salaries	Average	No.	Salaries	Average
1900	28,540	\$22,994,574	\$806	2,151	\$681,572	\$317
1910	37,702	40,927,955	1,093	6,375	2,851,760	449

WAGE EARNERS EMPLOYED IN ESTABLISHMENTS, INCLUDING CHILDREN UNDER 16

	MALE			FEMALE		
	No.	Wages	Average	No.	Wages	Average
1900	226,663	\$75,626,888	\$334	61,220	\$10,757,590	\$176
1910	376,872	173,435,642	460	72,571	18,970,212	261

CHILDREN UNDER 16

	No.	Wages	Average
1900	12,143	\$1,288,488	\$106
1910	13,282	2,112,648	159

PIECE WORKERS OUTSIDE OF ESTABLISHMENTS

	MALE			FEMALE		
	No.	Wages	Average	No.	Wages	Average
	5,938	\$2,166,683	\$365	2,463	\$543,516	\$221

The census of 1911, which covered the manufactures for the year 1910, was taken on the same basis as the census of 1901; the figures

MANUFACTURES		No. of establishments	Capital	Employees on wages	Wages paid	Cost of material	Value of products
Food products	1900	5,594	\$57,167,466	42,401	\$8,032,580	\$99,138,140	\$125,202,620
	1910	6,985	133,044,523	52,730	14,492,568	175,453,469	245,669,321
Textiles	1900	1,684	60,606,555	64,196	15,326,107	34,915,254	67,724,839
	1910	1,444	108,787,407	72,672	26,703,826	72,128,436	135,902,441
Iron and steel products	1900	517	40,861,164	24,766	9,846,247	14,816,891	34,878,402
	1910	824	123,561,319	48,558	25,792,388	52,452,103	113,640,610
Timber, lumber, and its remanufactures	1900	3,034	89,959,336	75,704	18,966,763	39,087,761	80,341,204
	1910	4,999	259,889,715	110,049	39,379,739	94,052,429	184,630,376
Leather and its finished products	1900	431	21,436,594	19,204	6,040,932	21,725,613	34,720,513
	1910	399	48,788,803	22,742	9,644,403	34,394,189	62,850,412
Paper and printing	1900	592	26,822,420	15,413	5,689,244	7,323,854	20,653,028
	1910	773	62,077,612	22,894	10,866,721	16,956,697	46,458,053
Liquors and beverages	1900	183	20,467,389	3,208	1,270,772	3,192,696	9,191,700
	1910	260	43,237,757	4,688	2,649,284	7,774,183	28,936,782
Chemicals and allied products	1900	128	10,272,743	2,868	1,037,932	6,633,549	11,437,300
	1910	178	26,926,124	5,274	2,393,971	14,059,022	27,798,833
Clay, glass, and stone products	1900	855	6,697,716	10,765	2,771,142	997,654	7,318,582
	1910	771	43,359,507	17,699	7,745,345	3,632,905	25,781,860
Metals and metal products other than steel	1900	363	20,332,505	9,358	3,888,724	7,716,902	19,561,261
	1910	341	67,133,540	17,502	9,776,371	33,609,447	73,241,796
Tobacco	1900	160	7,247,540	6,329	1,931,416	3,724,745	11,802,112
	1910	173	21,659,935	8,763	3,325,011	12,129,806	25,329,323
Vehicles for land transportation	1900	425	15,994,402	14,866	6,228,661	10,592,288	19,971,605
	1910	465	49,397,096	35,778	19,543,003	34,520,154	69,712,114
Vessels for water transportation	1900	57	3,297,914	2,587	811,413	745,946	2,043,668
	1910	172	10,351,765	4,414	2,332,240	2,135,229	6,575,417
Miscellaneous industries	1900	532	63,089,415	21,084	7,482,981	15,781,268	35,607,212
	1910	1,011	235,148,103	38,537	18,486,046	43,037,199	104,618,560
Hand trades	1900	45	613,328	605	248,290	135,197	599,329
	1910	423	11,120,403	8,826	4,097,785	5,173,750	14,829,741

The following tables for 1900 and 1910 respectively show the total number of salaried persons, male and female, and the total and the average salary paid each; the number of persons

therefore are comparable and show great increase in every line as compared with the year 1900.

The average wage of the male inworker in

1910 was highest in Manitoba and lowest in Prince Edward Island; of the female, highest in Alberta and lowest in Prince Edward Island.

AVERAGE WAGE OF INWORKERS BY PROVINCES

PROVINCE	Men	Women	Children under 16
Alberta.....	\$577	\$398	\$142
British Columbia.....	496	136	167
Manitoba.....	598	328	140
New Brunswick.....	329	179	132
Nova Scotia.....	370	186	91
Ontario.....	485	280	175
Prince Edward Island.....	154	54	36
Quebec.....	434	267	162
Saskatchewan.....	413	303	114

The whole number of establishments reporting the employment of motive power (water, steam, gas, electricity, etc.) in 1911 was 19,218. The total horse power supplied to all establishments in Canada was 2,898,100, of which over 1,400,000 was electric. The highest average of horse power per establishment was employed in Quebec, and the lowest in Prince Edward Island. The highest aggregate horse power was employed in Quebec and Ontario, and the lowest in Prince Edward Island.

PROVINCE	Estab-lish-ments	Total horse power	Average horse power
Alberta.....	290	41,766	144
British Columbia.....	651	134,106	206
Manitoba.....	439	65,776	150
New Brunswick.....	1,158	69,490	60
Nova Scotia.....	1,480	104,947	71
Ontario.....	8,001	756,374	94
Prince Edward Island.....	442	7,405	17
Quebec.....	6,584	1,643,589 *	250
Saskatchewan.....	173	10,907	63

* Includes 1,044,636 horse power supplied to cars, car works, and electric works.

Lumber Industry. The forest area of Canada according to official estimates is between 500,000,000 and 600,000,000 acres. Timber of commercial size covers about three-fifths of this area, divided among the provinces as follows: Nova Scotia, 5,000,000 acres; New Brunswick, 9,000,000 acres; Quebec, 100,000,000 acres; Ontario, 70,000,000 acres; Northwest Provinces (Manitoba, Saskatchewan, and Alberta), 100,000,000 acres; British Columbia, 100,000,000 acres; an aggregate of 384,000,000 acres. The forests are partly under Dominion and partly under provincial control. For many years both the Dominion and the provincial governments have adopted the policy of setting aside forest reserves for the purpose of providing a permanent supply of timber. The total area of the forest reserves increased from 7,413,760 acres in 1901 to 139,068,480 acres in 1912.

From an early day the forests of Canada have been one of her main sources of wealth, and the making of lumber has been a leading factor in the industrial life of the people. In the eastern provinces the trees have been cut from large sections of the country, including almost the whole of Ontario south of the Canadian Pacific Railroad. Formerly little attention was given to judicious cutting, and the approach of the lumberman meant the destruction of the forest. Present laws furnish partial protection. Worse than the onslaughts of the lumbermen has been

the destruction by fires, but an effort is now being made to guard against that also; nevertheless, some of the most valuable varieties of forest trees—notably the white pine—stand in danger of extermination. Only of very recent years in the west have the fine forests of Douglas fir and other useful trees been worked to any extent. The great forests of the country are government property, and a large revenue is obtained therefrom. The lumberman must first buy at auction a license to cut, after which he pays an annual rent on the ground and a royalty on the timber cut. Winter is the cutting season, when the snow affords means of transporting the logs to the streams, and the amount of the winter's yield is therefore dependent upon the duration of the snow. In former years the export of timber to English markets was generally in the log, but more recently mills have been established, and the logs are sawed before shipment. The value of forest products, excluding furs, amounted to \$51,082,000 in 1901 and to \$182,300,000 in 1912. Most of the product from the Great Lake region goes to the United States, while that from the St. Lawrence and Maritime Provinces goes to Europe. White pine and spruce are the most important varieties. The following table shows the variety of timber produced in 1911 and 1912 with value of the products:

VARIETY OF TIMBER	1911	1912
Lumber, lath and shingles.....	\$82,000,000	\$34,000,000
Firewood.....	47,000,000	50,000,000
Pulpwood.....	10,000,000	12,000,000
Posts and rails.....	9,500,000	10,000,000
Cross ties.....	6,000,000	8,000,000
Square timber exported.....	800,000	1,900,000
Cooperage.....	1,800,000	1,700,000
Poles.....	1,100,000	1,200,000
Logs exported.....	800,000	1,100,000
Tanning material.....	900,000	1,000,000
Round-mining timber.....	500,000	600,000
Miscellaneous exports.....	200,000	300,000
Miscellaneous products.....	10,000,000	10,500,000

Transportation and Communication. Canada owes its commercial development in a great measure to its facilities for navigation, particularly on the St. Lawrence River and Great Lakes. These great natural waterways have been further improved by the government by means of a thoroughgoing canal system, so that vessels drawing 14 feet of water can now pass from Lake Superior to the Atlantic. It has been the ambition of the Canadians to make it possible for ocean steamers to pass directly to and from the lakes, but it has seemed impracticable so far to carry it out, and Montreal will probably continue to be the head of ocean navigation. There are six canal systems under control of the Canadian government: (1) between Port Arthur or Fort William and Montreal; (2) from Montreal to the international boundary near Lake Champlain; (3) from Montreal to Ottawa; (4) from Ottawa to Kingston and Perth; (5) Trenton, Lake Ontario, to Lake Huron (not completed); (6) and St. Peter's Canal, from the Atlantic Ocean to Bras d'Or Lakes, Cape Breton. The total length of the canals in these systems is about 1594 miles (statute). The total cost of construction and enlargement, up to March 31, 1912, was \$101,892,862. A project of very great importance is the construction of a canal from

Georgian Bay, in Lake Huron, to the ocean, by way of the Ottawa and St. Lawrence rivers. The proposed route has been surveyed by government engineers, and, should the project be carried out, it would save over three days in inland navigation each way. Of other waterways, the Saskatchewan of the western plains is destined to be of great importance as a means of transportation. It was in early days a canoe route to the Rocky Mountains, and now has steamboats running for long stretches on the North Saskatchewan. Steamboats also run for a long distance on the Red River. The Hudson's Bay Company keeps a line of steamers operating upon the Mackenzie River for the benefit of its posts, and during the brief summer they pass back and forth between the mouth of the Athabasca and the mouth of the Mackenzie. There are also steamboats on the upper Fraser and Thompson rivers. Finally, peopling of the Yukon district caused a frequent steam service to be operated on that river and its larger headwaters, enabling passengers to go to any of the towns along the river by steamboat from the terminus of the White Pass Railroad, at White Horse Rapids, to its mouth. (See ALASKA; YUKON GOLD FIELDS.) Thirty-five steamship lines connect Canadian ports with those of America, Europe, Africa, and the Far East.

The same zeal which has characterized Canada in the utilization of her waterways has led her to still greater efforts for the creation of an adequate railway system. It was realized that intercolonial and transcontinental railways were a necessity, not only for the opening up of the west and the commercial development of the whole country, but more particularly as a political measure, inasmuch as the railways would serve as a bond of union between the provinces. Thus it was that, among others, two of the principal lines—the Intercolonial and Canadian Pacific—were undertaken through government initiative, and the former, as well as the Prince Edward Island Railway, was completed and is still held by the government. The Canadian Pacific, however, as is true of most other lines, was turned over to private hands, the government conferring upon the company a grant of land and a cash subsidy, and the line thus provided for was successfully completed in 1885. With the development of the country the railroads are able to rely more and more on their own resources, although they still seem to be far from a position of entire financial independence of the government. Aid to the railroads has been given by the provincial and municipal governments, as well as by the Dominion.

The following table shows the track mileage of the principal railways:

NAME	Miles operating
Canadian Pacific.....	10,712.4
Canadian Northern.....	4,317.
Grand Trunk.....	3,103.91
Intercolonial and Prince Edward Island	1,732.22
Other railways.....	6,861.47
Total.....	26,727.00

The capital invested in Canadian steam railways on June 30, 1912, was \$1,588,937.526. From 1851 the total value of public aid to steam railways, exclusive of the capital of the two government-owned railways, was \$208,072.074. Of this sum Dominion aid was \$154,075,235;

provincial aid, \$35,945,515; and aid by municipalities, \$18,051,324. In addition to these money grants the railways were also given land to the amount of 56,052,055 acres. The total length of all steam railways in Canada on June 30, 1912, was 26,727 miles, an increase of 1327 miles during the year. Of this amount 83 per cent was built in the four western provinces.

The Canadian Northern system controls approximately 6600 miles of tracks, and the Grand Trunk system about 4765 miles.

During the year 1912 the steam railways carried 41,124,184 passengers and 89,444,331 tons of freight. The operating expenses amounted to \$150,726,540; the gross earnings were \$219,403,753; and the net earnings, \$68,667,213. In 1912, 568 persons were killed and 3780 injured on Canadian railways.

In 1912 the government railways had a total mileage of 1732 miles, of which the Intercolonial had 1462 and the Prince Edward Island 269 miles. The gross earnings of the government roads were \$11,382,184; the operating expenses, \$11,209,850; and the net earnings, \$170,334. Canadian lines connect with those of the United States by bridges across the St. Lawrence, Niagara, and St. Mary's rivers, by tunnels under Detroit River, and at several points on the southwestern frontier. As to regulation of railway rates by the Board of Railway Commissioners of Canada, see RAILWAYS, *Governmental Regulation of Railway Rates*.

The capital invested in Canadian electric railways on June 30, 1912, was \$122,841,946; the mileage, 1308; gross earnings, \$23,490,250; net earnings, \$9,232,576.

Shipping and Navigation. Since 1891 Canadian shipping has markedly declined. The number of vessels on the registry books of the Dominion on Dec. 31, 1904, was 7152, with a net tonnage of 672,838. In 1911 the registered shipping consisted of 4644 sailing vessels and 3444 steamers; total tonnage, 770,466 tons. The following statement shows the number and tonnage of seagoing vessels, vessels (except ferries) trading on the lakes and rivers between Canada and the United States, and vessels employed in the coasting trade in 1912:

SEAGOING VESSELS, 1912

	Number	Tons
Entered.....	16,642	12,768,191
Cleared.....	16,224	11,821,414

VESSELS TRADING ON LAKES AND RIVERS BETWEEN THE UNITED STATES AND CANADA, 1912

VESSELS	ENTERED		CLEARED	
	No.	Tons	No.	Tons
Canadian.....	8,636	7,213,370	8,347	6,238,450
American.....	14,599	7,283,545	15,666	7,648,157

VESSELS EMPLOYED IN COASTING TRADE, 1912

VESSELS	ENTERED		CLEARED	
	No.	Tons	No.	Tons
British.....	90,407	33,756,336	84,314	30,051,735
Foreign.....	775	1,219,340	807	1,244,251

In 1911, of the seagoing vessels entered and cleared; 10,607, with 3,341,998 tons, were Cana-

dian; and 6870, with 12,712,337 tons, were British. Of the total number of lake and river vessels, both entered and cleared, trading between Canada and the United States in 1911 19,063, with 13,038,148 tons, were Canadian and 28,425, with 12,094,211 tons, were American. In 1911, of the vessels employed in the coasting trade, there were entered 108,637, with a tonnage of 46,200,008; cleared, 103,033, with a tonnage of 42,725,112.

Commerce. The foreign trade of Canada shows a remarkable growth. The following table gives the total value (including coin and bullion) of imports and exports, and the total value of imports entered for domestic consumption, for the fiscal years 1871, 1881, 1891, 1901, 1911, and 1912:

YEAR	Total imports	Total exports	Imports for home consumption	Exports of home produce
1871....	\$96,092,000	\$74,173,000	\$86,947,000	\$64,320,000
1881....	105,330,000	98,290,000	91,611,000	83,944,000
1891....	119,967,000	98,417,000	113,345,000	88,801,000
1901....	190,415,000	196,487,000	181,237,000	177,431,000
1911....	492,247,540	297,196,365	461,951,318	274,316,553
1912....	559,320,544	315,317,250	547,482,190	290,223,857

The principal imports for home consumption for 1912 were: iron and steel and manufactures thereof, \$103,262,905; coal and coke, \$39,639,907; wool and manufactures of, \$24,420,165; cotton goods, \$21,351,537; sugar and molasses, \$16,914,748; drugs and chemicals, \$12,918,514; breadstuffs, \$13,433,455; forest products, \$15,201,526.

The principal exports in 1912 were: agricultural produce, \$197,143,375, including wheat valued at \$62,590,563 and wheat flour valued at \$16,034,064; animals and their produce, \$48,219,654, including cheese valued at \$20,888,818; produce of the fisheries, \$16,704,678; forest produce, \$40,892,674; manufactures, \$35,836,284, including wood pulp valued at \$5,094,305; and mineral produce, \$41,324,516.

For the fiscal year ending March 31, 1913, the aggregate trade of Canada was \$1,085,264,449, for the first time being in excess of a billion dollars. Of this the total imports were valued at \$692,032,392 and the total exports at \$393,232,057.

For the calendar year 1913 the total trade of Canada, exclusive of coin and bullion, was \$1,119,578,117, as compared with \$1,015,901,912 for 1912, an increase of \$103,676,205.

Great Britain and the United States are the two most important countries trading with Canada. The following table shows the comparative importance of the two countries to the foreign commerce of Canada, in their relation both as suppliers and as buyers, for the fiscal years 1871, 1881, 1891, 1901, 1911, and 1912:

Thus the total volume of commerce with Great Britain has fallen from 50 per cent in 1871 to 32 per cent in 1912, while the total commerce with the United States in the same time has risen from 31 per cent to 53 per cent. From the table it can be seen that, although the greater part of the exports of Canada go to England (50.7 per cent in 1912), much the larger part of the imports (63.3 per cent in 1912) come from the United States. The preferential tariff of 33½ per cent in favor of British imports has retarded the falling off in British trade with Canada, but has not completely arrested the downward movement. There has been a falling off of exactly 20 per cent in the total trade between Canada and Great Britain since 1871.

Over 85 per cent of the foreign trade of Canada is with Great Britain and the United States.

The table following shows that the preferential tariff has not very materially affected the trade between Canada and countries other than Great Britain and the United States:

	1873	1891	1901	1912
Germany:				
Imports....	\$1,100,000	\$3,804,000	\$7,021,000	\$11,089,998
Exports....	77,000	582,000	2,142,000	3,577,847
France:				
Imports....	2,023,000	2,312,000	5,398,000	11,744,664
Exports....	32,000	254,000	1,581,000	2,048,768
Belgium:				
Imports....	347,000	655,000	3,828,000	3,686,419
Exports....	18,000	73,000	2,806,000	2,851,044
Newfoundland:				
Imports....	1,809,000	751,000	626,000	1,841,887
Exports....	2,801,000	1,468,000	2,260,000	4,131,602
West Indies:				
Imports....	2,175,000	3,238,000	1,802,000	2,743,801
Exports....	3,988,000	3,123,000	2,906,000	3,161,562
South America:				
Imports....	416,000	720,000	1,048,000	4,910,178
Exports....	1,285,000	1,063,000	1,519,000	4,139,520
China and Japan:				
Imports....	1,663,000	2,123,000	2,450,000	3,109,822
Exports....	46,000	79,000	700,000	900,330

Banking and Banks. Canadian banks are chartered by the Dominion Parliament, and are regulated by the Banking Act of 1890, which is subject to revision every 10 years. In order to be incorporated a bank must have a capital stock of \$500,000, of which at least \$250,000 must be paid up and deposited with the Minister of Finance before it begins business. Each shareholder of a failed bank is liable for a sum

YEAR	IMPORTS FOR HOME CONSUMPTION, MERCHANDISE ONLY			EXPORTS OF HOME PRODUCE, MERCHANDISE ONLY			TOTAL TRADE WITH	
	Total	Gt. Britain	United States	Total	Gt. Britain	United States	Gt. Britain	United States
1871...	\$84,214,000	\$48,498,000	\$27,185,000	\$55,181,000	\$21,733,000	\$26,715,000	\$70,231,000	\$53,900,000
		% 57.58	% 32.28		% 39.38	% 48.41	% 50.4	% 31.5
1881...	90,488,000	\$42,885,142	\$36,338,701	80,921,000	\$42,637,219	\$31,015,109	\$85,522,361	\$67,353,810
		% 47.39	% 40.15		% 52.69	% 38.32	% 49.8	% 39.3
1891...	111,533,000	\$42,018,943	\$52,033,477	85,757,000	\$43,243,784	\$34,829,436	\$85,262,727	\$86,862,913
		% 37.67	% 46.65		% 50.42	% 40.61	% 42.2	% 40.4
1901...	177,700,000	\$42,819,995	\$107,149,000	177,431,000	\$92,857,525	\$67,983,000	\$135,671,520	\$175,132,000
		% 24.10	% 60.30		% 52.33	% 38.32	% 38.2	% 49.3
1911...	451,745,108	\$109,934,665	\$274,844,858	274,316,553	\$132,156,924	\$104,115,823	\$242,091,589	\$378,960,681
		% 22.12	% 60.8		% 48.2	% 37.9	% 33.3	% 52.1
1912...	521,448,309	\$116,906,212	\$330,428,502	290,223,857	\$147,240,413	\$102,041,222	\$264,146,625	\$432,469,724
		% 22.4	% 63.3		% 50.7	% 35.15	% 32.5	% 53.2

equal to the amount which has been paid on his shares. There were, in 1914, 26 chartered banks, with 2950 branches. In the main the Canadian follows the lines of the Scottish banking system, providing an elastic currency which quickly responds to local needs wherever arising. By their numerous branches the banks gather up the money supply wherever not required for new enterprises and place it at the convenience of localities where most needed. The process is practically automatic, information of local business requirements being constantly sent in from the branches to the head offices, where an accurate survey of the financial field can at any time be taken. By reason of the ramifications of their business in every province, the banks, especially the larger ones, are national institutions and are perforce led to consider the business situation of the country as a whole.

Though the branch managers are allowed considerable independence, applications to them for loans beyond a fixed amount must, as a rule, be referred to the general manager at the head office, in whom supreme responsibility is placed. The banks are empowered to do a general banking business, discounting commercial paper, lending money on collateral security, accepting deposits, and are permitted to issue circulating notes, which are a first charge on their assets, up to the amount of their unimpaired paid-up capital in denominations of \$5 and multiples thereof. Since July 20, 1908, the banks have had a right to issue an emergency circulation during the crop-moving season (October 1 to January 1). The circulating notes, together with Dominion government notes, are practically the only currency, nearly all the gold being held in the bank reserves and silver being used for small change.

The security of the note holder is provided for, and the overissue of circulating notes is prevented, by the law compelling each bank to redeem its notes at its head office and in such commercial centres as are designated by the Treasury Board, whose head is the Minister of Finance. As a guaranty of the redemption of notes of failed banks, each bank must keep on deposit with the Minister of Finance a circulation redemption fund equal to 5 per cent of its average circulation. Banks are required to hold 40 per cent of their reserves in Dominion government notes, but they need not maintain a fixed minimum of cash reserves. Monthly returns are sent to the Finance Minister, and heavy penalties are exacted for false statements made in connection therewith. By the authority of the Bank Act, the Canadian Bankers' Association, an incorporated body in which each bank has one vote, supervises the issue of bank notes and the affairs of a failed bank. The notes of the latter may be redeemed by the Finance Minister out of the assets of the bank or out of the circulation redemption fund. These notes draw interest at 5 per cent from the day fixed for their redemption. An important fact is the solidarity of the Canadian system, the banks acting as a unit in cases of emergency and assuming the leadership and oversight which prevent a panic. The Dominion government maintains post-office savings banks and also savings banks managed by the Finance Department. Trust companies in Canada are not financial institutions. There are only two or three private banks in the Dominion.

The chartered banks of Canada on Dec. 31,

1912, had a total capital of \$114,881,014, with \$1,526,081,158 total assets and total liabilities of \$1,202,451,137. The deposits were \$1,012,418,550. The sum of \$58,219,328 was credited to the depositors in the post-office savings banks and the government savings banks. The post-office savings banks have been in operation since 1867.

Government. By the terms of the British North America Act of 1867, the provinces of Ontario and Quebec, known also as Upper and Lower Canada, joined with the Maritime Provinces of Nova Scotia and New Brunswick to form a federal government under the name of the Dominion of Canada. Since that time the original number of provinces has been increased to nine by the admission of Manitoba, British Columbia, Prince Edward Island, Alberta, and Saskatchewan, the last two formed out of the Northwest Territory which had been purchased from the Hudson's Bay Company; but the constitution drafted in 1864 and embodied in the Act of 1867 is still in force. Based upon the general principle of the definite division of powers between provincial and central governments, the Canadian constitution differs from that of the United States in the fact that all powers not explicitly assigned to the provinces are reserved to the central government. Under the exclusive jurisdiction of the federal legislature are the administration of the public debt and property, the imposition of taxes for general purposes, the organization of the public defense, including the militia; the subjects of banking, paper money, promissory notes, legal tender, currency, and coinage; the regulation of commerce, navigation, and shipping; the coast service, the postal service, census, statistics, patents, and copyright; naturalization, aliens, and Indians; marriage and divorce. The subjects within the scope of the provincial legislatures are, among others, those of taxation for local purposes, the regulation of local commerce, the erection of municipal corporations, the borrowing of money on the credit of the province. On the questions of agriculture and immigration, the federal and the provincial legislatures possess concurrent jurisdiction; but it is provided that in the contingency of a conflict of legislation, the law of the Dominion shall prevail. Although the powers of government have, in this manner, been definitely portioned out, there has been no lack of intrusion on the part of either party into the sphere of the other. On such occasions, when compromise has been found impossible, the principle of the superior authority inherent in the central government has been adhered to. Striking examples of this predominance are the right given the governor-general to disallow within a year any law enacted by the provincial legislatures and the power of appointing the lieutenant governors of the provinces.

The lawmaking power of the federal government is vested in the King of Great Britain or his representative and the Dominion Parliament. The Parliament, the seat of which is at Ottawa, is composed of an upper house, or Senate, and a lower house, or House of Commons. The members of the Senate, who are appointed for life by the governor-general in council, must be subjects of the king, 30 years of age, residing in the province whence they are summoned, and owning property there to the value of \$4000. There are 87 senators, of

whom 24 are from Ontario, 24 from Quebec, 10 from New Brunswick, 10 from Nova Scotia, 4 from Prince Edward Island, 4 from Manitoba, 3 from British Columbia, 4 from Alberta, and 4 from Saskatchewan. The House of Commons is elected practically by manhood suffrage for five years, on the basis of population. Officers of the civil service and government contractors may not sit in Parliament. It is provided that Quebec shall always have 65 representatives in the Commons, and the other provinces a number bearing the same ratio to their population as 65 bears to the population of Quebec. There were, in 1913, 86 members for Ontario, 65 for Quebec, 18 for Nova Scotia, 13 for New Brunswick, 10 for Manitoba, 7 for British Columbia, 4 for Prince Edward Island, 7 for Alberta, 10 for Saskatchewan, and 1 for Yukon Territory, a total of 221.

The executive power is vested in the King of England or his representative (the governor-general) and a privy council composed of a premier, who is likewise president of the privy council, 14 heads of departments, and 3 ministers of the cabinet, but without portfolios. The ministerial departments are those of State, Trade and Commerce, Justice, Marine and Fisheries, Railways and Canals, Militia and Defense, Finance, Posts, Agriculture, Public Works, Interior, Customs, Inland Revenue, and Labor. The relations of the executive to the legislature, and of the two branches of the legislature to each other, are the same as those of parliamentary government in Great Britain. The governor-general is guided by his ministers, who in turn are responsible to the House of Commons; and though the executive may reserve a law for the consideration of the home government, or disallow it altogether, the latter right is in practice never exercised, and the former is employed only when a measure concerns the interests of the Empire at large and tends to affect the relation of the Imperial government to foreign powers. Within Parliament the predominant power is wielded by the popular chamber. Not only must money bills originate in the Commons, but the Senate may not even amend a bill from the Lower House; its power of rejection is seldom employed, and though it possesses the right of initiative in many matters, its share in originating legislation is quite inconsiderable.

Of the provincial governments and of the differentiation between their scope of authority and that of the federal government, it may be said that in general they are endowed with the full power of control over local affairs, subject only to the consideration of the general welfare of the Empire. A detailed description of provincial governments will be found under the names of the several provinces. For the system of municipal government in Canada, see MUNICIPAL GOVERNMENT.

The judicial branch of the federal government consists of a supreme court at Ottawa, with appellate civil and criminal jurisdiction throughout the Dominion, and an exchequer court with powers of admiralty. There are no inferior federal courts, but the central government avails itself of the judicial machinery in each of the provinces, which comprises a superior court, county courts, police magistrates, and justices of the peace. To be precise, however, the superior and county courts are not exclusively provincial tribunals, in that their judges are ap-

pointed by the governor-general in council. The penitentiaries, too, are under the care of the federal government.

Army. The king is the commander in chief of the naval and military forces, but the control of them is in the hands of the Dominion Parliament. The Militia Act of 1868 was subsequently amended, especially in 1904, when a new Militia Act was passed, which intrusts the defense of Canada to all males between 18 and 60, excepting exempted or disqualified persons. The act places the Canadian land forces under a militia council, with the Minister of Militia and Defense as president. The council includes a civil member, four military members, and a financial member. There is also an inspector general, whose duty it is to inspect the forces and to report to the Minister of Militia and Defense in council on their readiness for war. The militia is divided into an active force serving for three years, and a reserve force, which includes all nonactive citizens liable to service. The active militia is raised by voluntary enlistment or by ballot. The new organization, exclusive of the permanent militia force, is designed to form peace training establishments which contain all the officers and noncommissioned officers of corps and part of the rank and file, and which, when expanded to war strength, constitute the first line of defense. They provide for enough officers and noncommissioned officers to train the corps to be formed in war time as duplicates of those sent to the front. These duplicates are the second line of defense. The permanent forces of Canada consist of 3118 officers, noncommissioned officers, and men. The active militia consist of 5259 officers and 60,755 noncommissioned officers and men. There are two royal schools of artillery, one of cavalry, one of mounted rifles, and five of infantry; also the Royal Military College at Kingston, Ontario, with a staff of nine professors and five instructors. The British garrison at Halifax, N. S., and the naval station at Esquimalt, B. C., were in 1905-06 abolished, and the control of both places was handed over to the Dominion government.

Navy. In 1910 the Naval Service Bill became a law. The act resembles the Militia Act, except that the naval service is to be voluntary, whereas the military law makes all males between 18 and 60 liable to military service. The bill provides for a Naval Service Department under the Department of Marine and Fisheries. The Royal Naval College has been established at Halifax, N. S. Two protected cruisers are being used for the training of officers and men—the *Niobe* at Halifax, N. S., and the *Rainbow* at Esquimalt, B. C. On March 31, 1911, the naval force consisted of 223 men. In 1913, while the Naval Service Bill remained in force, the *Niobe* and *Rainbow* were put out of commission.

Finances. The financial accounts of the Dominion of Canada are made up under three different headings, as follows: first, "Consolidated Fund," comprising general revenue and expenditure; secondly, "Loans" in revenue, and "Redemption" with "Premiums and Discounts" in expenditure, comprising the deposits and withdrawals from the post-office and government savings banks, the amount on deposit forming part of the floating or unfunded debt of the country; and, thirdly, "Open Accounts," comprising investments, trust funds, provinces

accounts, and capital expenditure on public works. The general revenue and expenditure, or Consolidated Fund, for the fiscal year ending June 30, 1912, were: receipts, \$136,108,217; expenditure, \$98,161,441. The chief items of revenue were: customs, \$85,051,872, and internal revenue (excise), \$19,261,662; post office, \$10,492,394; and railways, \$11,034,166. The chief items of expenditure were: interest on public debt and sinking funds, \$13,863,209; public works, \$10,344,487; collection of revenue, \$28,256,780; and defense, \$7,580,600. The net public debt of Canada on March 31, 1912, was \$339,919,461.

Population. In 1760 the French population amounted to about 70,000, confined to the immediate vicinity of the lower St. Lawrence and its tributaries; in 1791 Upper Canada had about 20,000 inhabitants and Lower Canada about 125,000. In 1861 the total population, exclusive of Indians, was 3,090,561; in 1871, 3,680,257. The population in 1911 was 7,204,838. The following table shows the growth of population for Canada and its provinces and territories from 1901 to 1911:

PROVINCES	1901	1911	Increase	Increase per cent	Land area square miles
Alberta.....	73,022	374,663	301,641	413.08	252,925
British Columbia.....	178,657	392,480	213,823	119.68	353,416
Manitoba.....	255,211	455,614	200,403	78.52	231,926
New Brunswick.....	331,120	351,889	20,769	6.27	27,911
Nova Scotia.....	459,574	492,338	32,764	7.13	21,068
Ontario.....	2,182,947	2,523,274	340,327	15.58	365,880
Prince Edward Island.....	103,259	93,728	-9,531	-9.23	2,184
Quebec.....	1,648,898	2,003,232	354,334	21.46	690,865
Saskatchewan.....	91,279	492,432	401,153	439.48	243,382
Yukon.....	27,219	8,512	-18,707	-68.73	206,427
Northwest Territories.....	20,129	18,481	-1,648	-15.79	1,207,926
Totals for Canada.....	5,371,315	7,206,643	1,835,328	34.17	3,603,910

In 1911 the density of the population of Canada per square mile was 1.93. The density of population per square mile of the provinces in that year was as follows: Alberta, 1.47; British Columbia, 1.09; Manitoba, 6.18; New Brunswick, 12.61; Nova Scotia, 22.98; Ontario, 9.67;

Quebec, 78,190, per cent 14; Halifax, 46,619, per cent 14; London, 46,300, per cent 22; Calgary, 43,704, per cent 894.

The increase of population is thus seen to have been smallest in those eastern provinces which have been settled by a population chiefly of British descent—there being in one case, that of Prince Edward Island, an actual decrease—and highest in the western region, where the mining and agricultural development attracted a large stream of population. In the last few years of the nineteenth and the opening years of the twentieth century there set in a large tide of agricultural settlers towards the Northwest Territories, resulting in the creation of two new provinces, Saskatchewan and Alberta, in 1905.

The populations of Alberta and Saskatchewan within their present limits were, respectively, 73,022 and 91,279 in 1901. According to the census of 1911 there were in the Dominion 1,586,154 foreign-born inhabitants, of whom 784,526 were born in Great Britain and 48,896 in other parts of the British Empire, 303,680 in the United States, 121,430 in Austria-Hungary, 100,971 in Russia, 49,194 in Norway and

Sweden, 39,577 in Germany, and 34,739 in Italy. The following table shows the volume of immigration into Canada, by provinces, during the fiscal years 1901-05 and 1912. In the returns for 1912 the two new provinces of Alberta and Saskatchewan appear.

DESTINATION OF IMMIGRANTS FOR FISCAL YEARS 1901-05 AND 1912

PROVINCES	1901	1902	1903	1904	1905	1912	Totals
Maritime Provinces.....	2,144	2,132	5,821	5,448	4,128	15,973	35,826
Quebec.....	10,216	8,817	17,040	20,222	23,666	50,602	130,503
Ontario.....	6,208	9,798	14,854	21,266	35,811	100,227	188,164
Manitoba.....	11,254	17,422	39,535	34,911	39,387	43,477	181,986
Northwest Territories.....	14,160	22,199	43,898	40,397	39,289	.....	159,943
British Columbia.....	2,600	3,483	3,373	6,994	6,008	51,829	76,292
Saskatchewan.....	.....	.....	.....	.....	.....	46,158	46,158
Alberta.....	.....	.....	.....	.....	.....	45,957	45,957
Not shown.....	2,567	3,348	1,838	1,093	1,977	.....	10,829
Total immigration.....	49,149	67,199	126,364	130,431	146,266	.....	875,658

Prince Edward Island, 42.91; Quebec, 5.69; Saskatchewan, 1.95.

Cities.—The per cent of urban population increased greatly from 1901 to 1911. Winnipeg, Vancouver, and Calgary had the highest rate of increase during the last decade. The following gives the population of the principal cities, as returned by the census of 1911 and the per cent of increase: Montreal, 470,480, per cent 76; Toronto, 376,538, per cent 81; St. John, 42,511, per cent 4; Winnipeg, 136,035, per cent 221; Vancouver, 100,401, per cent 272; Ottawa, 87,062, per cent 45; Hamilton, 81,969, per cent 56;

During the fiscal years 1901-04 there settled in Canada 139,077 from the United States, 121,235 from the United Kingdom, 15,562 from Russia and Finland, and 6885 from Germany. During the calendar year 1905, 144,618 immigrants arrived in Canada. Of these 64,863 came from Great Britain, 44,424 from the United States, and 35,331 from continental Europe. During the calendar year 1912 the total number arrived was 395,804. Of these 145,859 were from the United Kingdom, 140,143 from the United States, and 109,802 from other countries. During the calendar year 1913 the total number

arrived was 418,870. Of these 156,984 were from the United Kingdom, 115,751 from the United States, and 146,135 from all other countries.

The following table shows the rate per 1000 of population of the births and deaths in the census years 1891, 1901, and 1911, the excess of the birth rate over the death rate giving the natural increase of the population for those years:

YEARS	Birth rate	Death rate
Canada:		
1891.....	28.95	14.10
1901.....	27.82	15.12
1911 (not reported).....	....	....
British Columbia:		
1891.....	23.16	13.94
1901.....	15.36	9.78
1911.....	14.88	5.56
Manitoba:		
1891.....	23.53	10.36
1901.....	31.07	12.21
1911.....	34.93	22.91
New Brunswick:		
1891.....	27.70	13.36
1901.....	25.98	11.54
1911.....	....	....
Nova Scotia:		
1891.....	25.41	14.57
1901.....	23.29	11.61
1911.....	25.03	8.30
Ontario:		
1891.....	24.50	11.30
1901.....	23.51	13.51
1911.....	22.68	9.07
Prince Edward Island:		
1891.....	24.45	12.26
1901.....	21.07	11.49
1911.....	15.97	4.08
Quebec:		
1891.....	36.28	18.91
1901.....	37.53	18.54
1911.....	37.18	19.26
Northwest Territories:		
1891.....	24.98	7.32
1901.....	23.35	11.84
Alberta, 1911.....	23.52	13.86
Saskatchewan, 1911.....	17.76	12.22
Yukon, 1911.....	5.64	10.22

The following table shows the conjugal state of the population of Canada in 1901 and 1911:

CONJUGAL STATE	1901		1911	
	Number	Per cent	Number	Per cent
Single.....	3,312,593	61.67	4,311,652	59.8
Married.....	1,833,043	34.14	2,583,321	35.8
Widowed.....	250,186	4.19	268,810	4.4

The following table gives the figures for births, deaths, and marriages, by provinces, according to the census of 1911. The census figures given above are the latest vital statistics published for the Dominion as a whole.

PROVINCES	Births	Marriages	Deaths
Prince Edward Island.....	1,497	470	1,114
Nova Scotia.....	12,322	3,004	8,237
Quebec.....	74,475	15,254	35,904
Ontario.....	57,235	25,807	34,341
Manitoba.....	15,918	5,177	5,481
Saskatchewan.....	8,745	3,511	2,727
Alberta.....	8,813	3,630	3,618
British Columbia.....	5,841	4,509	3,660
Yukon.....	48	41	87

The population of Canada includes a large variety of race elements, and the process of amalgamation has been much less active than in the United States. The great expanse of area

and the sparseness of the inhabitants admit of isolation, and are largely responsible for the comparative lack of amalgamation. The French, who were the first settlers, located principally along the St. Lawrence in what is now the Province of Quebec, and their descendants still constitute a large majority of the inhabitants of that province. In the determination of the policy of the British government formerly, and of the Dominion to-day, the presence of this French element has been and is a main consideration. The French language is still commonly spoken and is often heard even in the Dominion Parliament. The French were the hunters and trappers of the early days, and in this capacity scattered throughout the vast domain, mingling freely and amalgamating with the Indians, which accounts for the population of half-breeds so largely represented in Manitoba and the Northwest Territories. The French Canadians are well represented also in the recent western colonization. In the other eastern provinces people of British descent are in the great majority—the Scotch in Nova Scotia and the English in the other three. The Irish are well represented in the larger cities. The eastern townships of Quebec and parts of Ontario, Nova Scotia, and New Brunswick were settled by Loyalists from the revolted American Colonies, who emigrated there during or following the time of the American Revolution. Ontario received a contingent of the New England opponents of the War of 1812.

In 1911 the Indians in Canada numbered 105,592; in 1913 they numbered 109,937. The care of the Indians is in the hands of the Indian Department of the Dominion government, which has special officers looking after Indian affairs in each province. Reservations are provided for the tribes, but the Indians are not necessarily confined to them. Special provisions, such as annuities and financial assistance, are provided for the Treaty Indians. Others, however, such as those of British Columbia, successfully support themselves. Acts passed by the chiefs and councilors for the regulation of local affairs may be enforced if approved by the government. Rights of franchise and full citizenship are given the tribes as they become sufficiently advanced in civilization. Much progress is being made in this direction, especially by the tribes of British Columbia, yet hunting and fishing remain their chief occupations, though they work in many saw mills, fisheries, etc. Intertribal conflicts are of rare occurrence, nor has their relation with the general government been characterized by so great a degree of friction as has prevailed in the United States.

Religion. There is no state church, but to the Roman Catholic church in Quebec are guaranteed the privileges enjoyed previous to British possession. This church was the first and for a long time practically the only church in the Canadian territory, and still includes the great mass of the population of Quebec, and over two-fifths of the total church membership of the Dominion and 39.71 per cent of the total population. The Catholics are of least relative importance in Ontario, Manitoba, and Alberta. The Presbyterians, Methodists, and Anglicans rank next in order of importance. While all these are well distributed throughout the various provinces except Quebec, the Methodists are far in the lead in Ontario, but are exceeded by the Presbyterians in some of the other provinces,

particularly Nova Scotia. Neither of the two latter denominations is divided into numerous factions, as in the United States. Of other denominations, the Baptists and the Lutherans are the strongest. The leading sects have each one or more divinity schools. The following table gives the membership of the leading denominations:

DENOMINATIONS	1891	1901	1911	Per cent of total pop., 1911
Anglicans.....	646,000	681,494	1,043,017	14.47
Baptists.....	257,400	318,005	382,666	5.31
Baptists (Freewill).....	45,100			
Congregationalists.....	28,100	28,293	34,054	.47
Lutherans.....	63,900	92,524	229,864	3.19
Methodists.....	847,700	916,886	1,079,892	14.98
Presbyterians.....	755,300	842,442	1,115,324	15.48
Roman Catholics.....	1,992,000	2,229,600	2,833,041	39.31

Education. There is no centralized system of education for the whole Dominion, each province being left to control its own educational matters. In all provinces the schools are free, and in most provinces attendance is compulsory. Local trustees are elected to look after the separate schools, but a careful supervision is exercised by the provincial superintendent and his council. Alberta, British Columbia, Manitoba, Ontario, and Saskatchewan each has a Minister of Education, who is a member of the provincial cabinet. Especially noteworthy is the thorough and comprehensive school system of Ontario. In provinces where Catholics have a strong representation (Quebec, Ontario, and Manitoba) the denominational problem has been the most important one that has confronted the educational system, and in the case of Manitoba it has been of a highly perplexing nature. In Quebec there is a complete cleavage between Protestants and Roman Catholics, extending even to the council of public instruction, which is divided into Catholic and Protestant committees, the former committee being controlled by Roman Catholic bishops. In Ontario the educational council is not divided, but either Protestant or Roman Catholic authorities, under certain conditions, can establish separate schools. In Manitoba there are no separate schools, but religious instruction may be given to those pupils whose parents may demand it. The expense of the schools is met by government grants and local taxation, the latter covering more than two-thirds of the expenditure for all the provinces, but differing greatly from province to province. In Ontario there are separate schools for Roman Catholics, and in Quebec for Protestants. In other provinces the schools are nonsectarian. The following table gives the number of public schools, teachers, pupils, and expenditure for 1911:

PROVINCES	Year ended	Schools	Teachers	Pupils	Expenditures
Ontario.....	Dec., 1910	6,575	11,873	514,774	\$10,979,268
Quebec.....	June, 1911	6,896	13,238	397,060	6,224,146
Nova Scotia.....	July, 1911	2,657	2,855	104,994	1,329,874
New Brunswick.....	June, 1911	1,186	1,991	69,327	286,275
Manitoba.....	Dec., 1910	2,227	2,774	76,247	4,000,871
Brit. Columbia.....	June, 1911	573	1,163	44,945	2,641,522
P. E. Island.....	June, 1910	438	591	17,397	181,177
Alberta.....	Dec., 1910	1,195	1,610	55,807	3,862,394
Saskatchewan.....	Dec., 1910	1,925	2,726	65,362	3,655,428

Higher Education in Canada. In the development of higher education in Canada the racial differences and political conditions of early settlement produced strikingly contrasted results. After the establishment of British rule in Lower Canada (now the Province of Quebec), the French clergy, armed with a spiritual authority that included the educational supervision of their parishioners, adopted an attitude which has ever since shaped the character of the French-Canadian colleges and universities according to the doctrines and polity of the Roman Catholic church. To Upper Canada (now Ontario), and to the provinces of Nova Scotia and New Brunswick, there was a notable emigration of United Empire Loyalists from the United States during 1783-88. This was succeeded by an influx of English, Scotch, and Irish during the first half of the nineteenth century. From these two sources distinct and often contradictory tendencies in higher education were manifested with as much emphasis as in the case of French Canada. In the latter, elementary education was mostly religious; while in the early English-speaking provinces the common school was founded by the United Empire Loyalists on the New England pattern. In the founding of universities and colleges religious differences became at first even more numerous and accentuated, and remained so until toleration and the development of broader ideas as to university functions prepared the way for extensive changes. Canada has 21 universities and about 60 colleges, divinity schools, normal schools, conservatories of music, etc. There are also in the Province of Quebec a number of classical colleges under the control of the Roman Catholic hierarchy, and nearly all of them are in affiliation with Laval University. Several high-class technical schools have been established in Toronto.

Laval University, in Quebec, the outgrowth of the seminary founded by the famous Bishop of that name in 1663, and definitely established as a theological seminary in 1852, best illustrates the type of higher education prevalent in French Canada. In this university, as in its branch of the same name at Montreal, the appointment and removal of professors and the regulation of the curriculum are under ecclesiastical control. The dominant consideration is that the Roman Catholic church shall maintain in the college and university as complete supervision of doctrine and discipline as it does in the elementary separate school. The royal charter under which Laval University was founded observed the spirit and letter of the Treaty of 1763, by which the British government had guaranteed to French Canada the continued enjoyment of its religious privileges.

In English-speaking Canada the origin and development of universities illustrate (1) denominational exclusiveness and control; (2) the abolition of denominational tests and the growth of a more comprehensive university idea; (3) establishment of universities as provincial institutions to which colleges and universities originally sectarian have become affiliated; (4) the tendency of the strictly denominational college and university to emphasize the teaching of theology. It is not meant that these changes have characterized all the Canadian institutions of higher education, but they have been sufficiently numerous and influential to indicate cer-

tain general principles of progress. The University of Toronto, e.g., was founded as King's College in 1827; but its attempted control by sectarian persons aroused such opposition that religious restrictions were abolished, and the university became an unsectarian institution, representing the whole province, possessing teaching as well as degree-conferring powers, and having a large number of affiliated colleges. Women are admitted to its degrees. With it are federated Trinity (Anglican) and Victoria (Methodist) universities and St. Michael's College (Roman Catholic); and in affiliation with it are the theological colleges of Knox (Presbyterian), Wycliffe (Anglican), besides three conservatories of music and agricultural, dental, veterinary, and pharmaceutical colleges. McGill University, Montreal, founded in 1821 by private bequest and reorganized in 1852, is the chief university of the English-speaking population of Quebec. Its faculties of medicine and of practical and applied science are remarkably well organized. It presents a record of steady and unfettered growth under the combined influence of public-spirited citizens and far-sighted educators. With it is incorporated Macdonald College, at Ste. Anne de Bellevue, and in affiliation with it is the Congregational College of Canada and other educational institutions. McGill University has established a branch, named the McGill University College of British Columbia, with classes leading to degrees, at Vancouver and Victoria, B. C.

Of universities denominational in origin but unsectarian in requirements of admission may be mentioned Queen's (Presbyterian), Victoria (Methodist), McMaster (Baptist), Ottawa (Roman Catholic), Acadia (Baptist), Trinity (Church of England), New Brunswick (Church of England), now the provincial university, and Mount Allison (Methodist). Of these Victoria and Trinity have been federated with Toronto University. The University of King's College (Church of England), Nova Scotia, is an example of a Protestant and strictly denominational institution, which retains much of the character of its original foundation. The University of Bishop's College, Lennoxville, P. Q., though probably not so strictly denominational as King's College, leans towards that educational type. Dalhousie University at Halifax is un-denominational and the most important seat of learning in the Maritime Provinces. Mention should also be made of the Western University and College, London, Ont., and the University of St. Francis Xavier's College, Antigonish, N. S. In some of the denominational institutions that are affiliated with such universities as Toronto and McGill, theological teaching retains a distinctive character and importance; and besides these there are several colleges which are chiefly or exclusively theological: St. John's, Wesley, St. Boniface, and Manitoba colleges, in Manitoba; Huron, Wycliffe, and Knox colleges, in Ontario; Congregational, Presbyterian, Wesleyan Theological, and Montreal Diocesan Theological, in Quebec; King's and Presbyterian colleges, in Nova Scotia; Alberta (Methodist), Robertson (Presbyterian)—both in affiliation with the University of Alberta—the Lutheran College, and Mount Royal College (Methodist) in the Province of Alberta; Ryerson College (Methodist), Latimer Hall (Anglican), Westminster Hall (Presbyterian), St. Mark's Hall (Anglican), Okanagan (Baptist), in British

Columbia; and Regina College (Methodist) in the Province of Saskatchewan.

In the newest portions of Canada the lesson and benefit of higher educational development in the older provinces were signally manifested in the organization of the University of Manitoba, which was founded in 1877, seven years after the province was constituted. The idea of a university which was to be not only an examining and degree-conferring body, but also in large part a teaching body, was speedily realized. With it are affiliated the denominational colleges of St. Boniface (Roman Catholic), St. John's (Anglican), Manitoba (Presbyterian), Wesley (Methodist), the Manitoba Medical College, and the Manitoba College of Pharmacy. The provincial universities of Alberta, British Columbia, and Saskatchewan are, in educational breadth and inclusiveness as well as in organization, similar to the University of Manitoba. The University of Calgary is likewise free from sectarian requirements. The Canadian universities, excepting those under Catholic control, are democratic in their form of government, and the majority admit women to their degrees. Organization for specialized research has thus far been undertaken chiefly in Toronto and McGill universities.

The principal scientific and art societies are the Royal Society of Canada; Ontario Society of Artists; Royal Canadian Academy of Arts; Law Society of Ontario; Natural History Society of Montreal; Canadian Society of Civil Engineers; Royal Canadian Institute, Toronto; Royal Ontario Museum; Nova Scotia Institute; Institut Canadien de Quebec; Natural History Institute, New Brunswick; Geographic Board of Canada, Ottawa; Scientific and Historical Society, Winnipeg; and Society of Natural History, Victoria, with a fine local museum.

Decrease of Illiteracy. From 1891 to 1901, and from 1901 to 1911, there was a notable decrease of illiteracy in Canada. The census returns of 1891 gave a population of 4,279,634 persons five years old and over. Of these 3,176,667 could read and write, and 207,126 could read only. There were, therefore, 3,883,793 persons who could read, or 79.1 per cent of the population of five years and over. The census returns of 1901 gave a population of 4,728,631 persons of five years old and over. Of these 3,918,915 persons could read and write, and 129,584 could read only. There were, therefore, 4,048,499 persons who could read, or 85.6 per cent of the population five years old and over. Thus there was not only a marked decrease of illiteracy, but there was also a very great decrease in the number of literate persons who could read only. The census of 1911 shows 6,319,160 persons five years old and over. Of these 5,622,844 can read and write; 32,863 can read only. The total who can read, 5,655,787, or 89.5 per cent of the total population—a gain of nearly 4 per cent. There was a greater decrease, in the number that could read only, than during the decade from 1891 to 1901.

The decrease of illiteracy was absolute as well as relative in the provinces of New Brunswick, Nova Scotia, Ontario, Prince Edward Island, Quebec, and in the Yukon Territory, being most marked in the eastern provinces; in the western provinces, on the other hand, the decrease was only relative, there being an actual absolute increase in the number of illiterates, due to the

great increase in population. The following table shows, by provinces, the number of illiterates, and their relation to the total population, in the two census years 1901 and 1911:

POPULATION FIVE YEARS OLD AND OVER IN 1901 AND 1911

PROVINCES	CANNOT READ OR WRITE			
	Year	Number	Per cent of total	Total
Alberta.....	1901	19,116	30.56	62,554
	1911	41,510	12.72	326,221
British Columbia.....	1901	4,051	24.84	163,336
	1911	41,407	11.61	356,603
Manitoba.....	1901	31,912	14.55	219,290
	1911	52,333	13.31	393,042
New Brunswick.....	1901	47,054	16.19	290,732
	1911	43,114	14.05	306,896
Nova Scotia.....	1901	58,002	14.25	407,152
	1911	44,838	10.34	433,801
Ontario.....	1901	171,378	8.75	1,958,635
	1911	147,225	6.51	2,261,053
Prince Edward Island.	1901	9,897	10.77	91,860
	1911	6,380	7.61	83,792
Quebec.....	1901	250,017	17.71	1,411,324
	1911	216,639	12.66	1,712,166
Saskatchewan.....	1901	27,477	35.11	78,185
	1911	57,738	13.70	421,432
Yukon.....	1901	9,436	35.13	26,864
	1911	1,087	13.58	8,006
Northwest Territories.	1901	15,292	81.78	18,699
	1911	11,182	69.25	16,148
Canada (total).....	1901	680,162	14.38	4,728,631
	1911	663,453	10.50	6,319,160

History. It is probable that Bjarni Herjulfson (q.v.), a Norseman, sighted the coast of Canada, opposite Greenland, in 986. and that Leif Ericson sailed along a considerable part of the east coast in 1000. John Cabot (q.v.) in 1497 reached the shores of the New World in the neighborhood of the Gulf of St. Lawrence. It is upon this voyage that England subsequently based her claim, in part, to the whole of North America. For the most part, however, the territory included within the present Dominion, excluding the former Northwest Territories and the Hudson Bay country, was explored and first settled by the French. Basque and Breton fishermen began to visit the cod banks of Newfoundland as early as 1504; Denys of Honfleur and Aubert of Dieppe explored the Gulf of St. Lawrence in 1506 and 1508, respectively; in 1518 the Baron de Léry attempted to found a colony in America and left some cattle on Sable Island; and in 1524 Verrazano sailed along the coast of North America from the thirty-fourth to the fiftieth parallel of north latitude. In 1534 Jacques Cartier (q.v.) entered the St. Lawrence and at Gaspé took formal possession of the country in the name of the King of France; and on a second voyage, in 1535-36, he ascended the river as far as Hochelaga (Montreal) and wintered at Stadaconé (Quebec). While passing up the gulf, he entered the present Pillage Bay and gave it the name St. Lawrence, which was afterward extended to the gulf and the river. Jean François de la Roquette, Sieur de Roberval (q.v.), with the assistance of Cartier, made an abortive attempt to establish a colony at Cape Rouge in 1541-43. The Marquis de la Roche received a commission from the King as lieutenant general of Canada, and in 1598 failed in an effort to colonize New France, but left a number of his convict crew on Sable Island; and in the following year Pontgré and Chauvin established a short-lived settlement at the mouth of

the Saguenay. In 1603 Champlain made the first of his voyages to Canada, and his name is inseparably connected with the history of New France from that date until the time of his death, in 1635. (See CHAMPLAIN, SAMUEL DE.) In 1604 he assisted Pierre du Guast, Sieur de Monts, in bringing out a colony which first settled on Dochet Island, in the St. Croix, and in the following year was moved to the site of the present Annapolis in Nova Scotia (q.v.). This colony was broken up temporarily by the English under Samuel Argall in 1613, and the first permanent settlement in Canada was made at Quebec in 1608 by Champlain, who within the next few years discovered lakes Champlain (1609), Huron (1615), and Ontario (1615), established a temporary trading post at Montreal (1611), and by taking part with the Hurons and Algonquins, the original inhabitants of Canada, against the Five Nations, in 1609 and 1615, committed France to a policy which was to be of the greatest significance in the history of New France, since it aroused the enmity of the powerful Iroquois, who united first with the Dutch and then with the English, and frequently thwarted the French in their schemes of expansion and conquest. In addition to making numerous inroads upon the settlements of the French themselves, they in time virtually annihilated the Hurons, who had allied themselves to France. "They ruined," says Parkman, "the trade which was the lifeblood of New France; they stopped the current of her arteries and made all her early years a misery and a terror." The French governors repeatedly attempted to overcome the confederacy and at times seemed on the point of meeting with success; but in spite of severe reverses and of the occasional destruction of their towns, the Iroquois continued to stand as a barrier to French encroachments and as a protection to the English colonists, though, largely as a result of the vigorous policy of Frontenac (q.v.), the ablest of the French governors after Champlain, their aggressions and inroads virtually ceased in the beginning of the eighteenth century. Catholic religious orders enthusiastically aided the colonizing energy of the French. In 1625 several Jesuits arrived at Quebec, and for almost half a century thereafter the order had a preponderating influence over secular as well as religious affairs, inasmuch that during the early period of its history New France was in many respects essentially a mission. The Recollet fathers, the Sulpicians, and the Ursulines were scarcely less zealous to build up a Catholic New France. It was the misfortune of the Jesuits to acquire a predominant influence over the Hurons, whose virtual destruction in 1649 by their inveterate enemies, the Iroquois, involved the martyrdom of heroic missionaries. The affairs of the colony having been grossly mismanaged in the first two decades, Richelieu, in 1627, organized the Company of New France, better known as the Company of the Hundred Associates—a corporation which, under the quasi supervision of the crown, virtually ruled the whole of New France until 1663, besides exercising a monopoly over the immensely valuable fur trade. In 1642 Montreal was permanently founded by a company of religious enthusiasts headed by the Sieur de Maisonneuve, and in 1659 Laval-Montmorency (q.v.), the titular Bishop, by papal appointment, of Petraea in Arabia, was placed at the head of the Catholic church in New France, in

which capacity he had a powerful influence for many years over civil as well as ecclesiastical affairs.

In 1663 Louis XIV dissolved the Company of New France and placed Canada under the direct control of the crown, though for 10 years thereafter (1664-74) a new corporation, the Company of the West, exercised a virtual monopoly over the trade of the colony. Under the royal government, which lasted until 1760, the affairs of New France were administered by a governor, an intendant, and a superior council, all appointed by the crown, the governor being empowered to command the troops, conduct negotiations with foreign colonies and Indian tribes, and supervise all matters of administrative routine; the intendant to preside at the council, exercise independent legislative and judicial power, and supervise the expenditure of all public moneys, besides acting virtually as a spy on the governor; and the supreme council, composed of the governor, the intendant, the bishop, and five, later seven, and still later 13, councilors, to issue decrees for the government of the colony in civil and fiscal affairs, and to sit in judgment on various civil and criminal causes. The distinctive features of the government of Canada throughout the French régime were absolutism and paternalism, the individual settler being robbed of all initiative and forced to look for everything to the general government, which habitually intervened in the most trivial affairs of everyday life. During the period of royal control the celebrated feudal system of Canada, first established by Richelieu and based, with important modifications, upon the system which had obtained in ancient France, took definite form. Large grants, called *seignories*, were made to men of rank or prominence, known as *seigneurs*, who held, in many cases directly from the crown, by the "tenure of faith and homage," and who, in turn, made smaller grants to the *habitants* or *censitaires*, whose tenure rested upon their payment of annual rentals in money or produce, and in some cases upon their rendering to their overlords certain feudal services, such, e.g., as the *corvée*. The settlements, called *côtes*, were almost uniformly made along streams, the houses being built in long lines, instead of being arranged around a common centre, as was the case in many of the New England villages—each *habitant* receiving a narrow strip of land, fronting on a river or creek and extending for a considerable distance to the rear. The system was not interfered with at the time of the English conquest in 1760, and survived in Lower Canada (Quebec) until 1854, when it was finally abolished. The virtual monopoly enjoyed by the Company of the West did little more than that of its predecessor, the Company of the Hundred Associates, to establish a permanent commerce. The French King revoked the company's charter in 1674.

With the English colonists to the south the inhabitants of New France came into conflict during the last part of the seventeenth century. Such events as the destruction of the French settlement at Port Royal by Argall in 1613 and the capture and occupation of Quebec by David Kirke in 1629-32 may be regarded as sporadic; but with the outbreak of the first of the so-called French and Indian wars in 1689, the long contest between the French and English for supremacy in North America was initiated. (See

KING WILLIAM'S WAR; QUEEN ANNE'S WAR; KING GEORGE'S WAR; FRENCH AND INDIAN WAR.) Of these wars the first two especially, 1689-97 and 1702-13, may be differentiated from the last as being essentially the fighting out of European quarrels on American soil. On the part of the French the conflict took the form of sudden raids, with the help of their Indian allies, on the frontier settlements of New York and New England. Though no important victory was gained on either side, the English nevertheless acquired by the Treaty of Utrecht (1713) Acadia, Newfoundland, and the Hudson Bay Territory. Thirty-five years of peace followed, marked by rapid development both among the French and the English. The tide of English colonization, breaking through the passes of the Alleghanies, was checked by the French, who had made themselves masters of the great rivers of the west. The war which broke out in 1754 was essentially American, and though it later merged into the greater struggle of the Seven Years' War, the stake between England and France was the mastery in America. In the French and Indian War Canada experienced both the advantages and disadvantages of the absolute system of government under which it lived. Against the armies of Great Britain, weakened by incapacity on the part of their commanders and constant friction between British officers and the Colonials, it presented a force of trained fighters, under officers, for the most part, acquainted with the nature of the country, more skilled in forest lore and knowledge of Indian character. This would account for the ill success of the English during the first part of the war. When it came, however, to a test of endurance between the combatants, Canada, with its sparse population of fur traders and forest rangers, could never hope to hold out against the English colonists, if, as was the fact, it was forced to depend for help on distant France, with the British holding the mastery of the seas. The capture of Quebec by Wolfe in September, 1759, practically ended the war. By the Treaty of Paris (q.v.) in 1763, Canada, together with all the territory between the Alleghanies and the Mississippi River, claimed by France, was ceded to Great Britain.

Canada was under a military government from 1760 to 1764, and under a sort of provisional government, organized in pursuance of a proclamation by George III, from 1764 to 1774, when the British Parliament passed an important measure known as the Quebec Act (q.v.), which extended the province to the Ohio and Mississippi rivers, provided that Roman Catholics should not be interfered with in their religion, intrusted the administration of affairs to a governor and a legislative council appointed by the crown, and formally recognized the old civil laws and civil institutions of French Canada, though the English criminal laws were to be in force throughout the province. During the American Revolution the Continental Congress attempted to secure the active alliance of Canada, and to that end sent a commission, made up of Franklin, Chase, Charles Carroll, and John Carroll, to Montreal; but the province remained loyal throughout, and at the close of the war its population was augmented by the immigration from the United States of between 30,000 and 40,000 Loyalists, whose advent, says the Canadian historian Bourinot, "was the saving of British interests in the great region which England still happily retained in North Amer-

ica." It was these immigrants who founded New Brunswick and Upper Canada (Ontario), and their descendants have continued to the present day to constitute the most important and influential element in the population of English-speaking Canada.

By the Treaty of 1783 the area of Canada, as established by the Quebec Act, was reduced by the formal relinquishment to the United States of the territory now constituting the States of Wisconsin, Michigan, Ohio, Indiana, and Illinois, and in 1791 the province was divided by the so-called Constitutional Act into two sections, Upper Canada and Lower Canada, the former of which, then having a population of about 20,000, was inhabited almost entirely by men of English descent, and the latter, then having a population of about 125,000, mostly by men of French descent. Each section was to have a legislative council, to be appointed by the king, for life; an assembly, to be chosen by a popular vote; and a governor and executive council, to be appointed by the king; while French institutions were for the most part to obtain in the one and English institutions in the other. In Lower Canada the criminal law of England remained in force. The so-called Maritime Provinces—New Brunswick, Nova Scotia, Cape Breton, and Prince Edward Island—were placed under administrations very similar to that of Upper Canada. In Lower Canada a party of discontent almost immediately arose, and until the reorganization of the government, in 1841, there was almost continual friction between the popular assembly on the one side, representing the French element, and the governor and legislative council on the other, representing almost exclusively the English element. In spite of the unifying influence of the War of 1812 with the United States (see *UNITED STATES, History*), in which men of all races throughout Canada participated, this racial antagonism became more and more accentuated, until, in 1837, a certain element of the French population, under the leadership of Louis J. Papineau (q.v.), angered by the intervention of the British government, rose in revolt against the British authority, but were quickly suppressed.

Meanwhile in Upper Canada much discontent was caused by the dominance of a small class, descended mainly from the Loyalists and united, it was charged, under an alleged "family compact" for the purpose of monopolizing the public offices. The popular dissatisfaction with the prevailing state of affairs was greatly increased by religious antagonisms and by sectarian discrimination in the allotment of the public lands and the exposure of apparent frauds in their disposition. Under the Quebec Act of 1774 a large part of crownlands had been set apart for the maintenance of a Protestant clergy. The continuance of this provision under the Constitutional Act of 1791, and known as the Clergy Reserves, resulted in Upper Canada in the privileged position, with regard to land ownership and profits, enjoyed by the Church of England. In 1837, also, the more radical of the reformers, doubtless encouraged by the outbreak in Lower Canada, organized a "rebellion," under the leadership of William L. Mackenzie (q.v.), but were defeated and driven out of the province before the close of the following year. Mackenzie and his more radical adherents wanted independence, but many went no further than the demand for an executive council responsible

to the legislature. The "rebellion" in Upper Canada differed from that in the sister province by the greater emphasis which the popular party placed upon responsible government and by a clearer perception of its remedial uses. In Lower Canada, though reform of the executive council was likewise an essential issue, its full significance was less generally understood. There racial suspicion and hostility, with their accompanying passion for the inviolability of the Roman Catholic religion and the French language, were strong ingredients in the popular discontent.

Meanwhile Lord Durham had been sent out from England as Governor-General and High Commissioner "for the determining of certain important questions depending in the provinces of Upper and Lower Canada, respecting the form and future government of the said provinces," and, largely as a result of the famous report made by him in 1839, the two provinces were reunited, in 1841, by an Act of Parliament, which provided for a governor, to be appointed by the crown, a legislative council, also to be appointed (for life) by the crown; a legislative assembly, to which Upper and Lower Canada were to send an equal number of representatives, to be elected by popular vote; and an executive council, or cabinet, to be chosen by the governor from the legislative council and the legislative assembly. The Maritime Provinces retained their separate governments.

The composition and operation of the executive council, under the Act of Union in 1841, disappointed the Liberals, more especially those who had sympathized with the rebellion of 1837-38. Lord Durham's report was designed to prepare the way for the council's responsibility to the popular branch of Parliament; but the course of politics disclosed an influential and determined opposition to any such interpretation. This opposition was due partly to uncertainty in British government circles as to the effect of responsible government upon the Imperial connection with and control of Canada, and partly to the hostility of the Conservative party. It was only natural that the uncertainty should be reflected in the attitude of some Canadian governors, and that the hostility should be deepened by party struggles. The first governor of the province, Lord Sydenham, permitted men of opposed views to be members of his council, but with unsatisfactory results. His successor, the prudent and conciliatory Sir Charles Bagot (q.v.), was not able fully to establish the practice of conferring with advisers of one political complexion; and soon after the appointment of Sir Charles Metcalfe (q.v.) as Governor, his aversion to an executive council which was constituted to give him advice tantamount to a command produced a development of party violence which convulsed the country. Not until 1849, during the governorship of the Earl of Elgin (q.v.), when French pride was placated by a law granting compensation for losses of property in the rebellion in Lower Canada, was there certain promise of more peaceful conditions. The passage of the bill, for signing which Lord Elgin was stoned and rotten-egged at Montreal by a mob which also burned the Parliament House, marked the final acceptance of responsible government and the supremacy of the Canadian legislature in Canadian affairs.

From 1849 until 1867 the course of political

development was determined by the necessity of readjusting the unequal restrictions and responsibilities which irritated the united provinces under the Act of 1841. One notable result of the act, however, was the system of administration in which leaders from both provinces, respectively supported by their ablest associates, were represented. But this harmony was more than offset by the discord inherent in the provisions of the act. The plan of equal representation, together with the more rapid growth of the English-speaking province, threatened disruption. At the same time seigniorial tenures in Lower Canada burdened the people, and the clergy reserves in Upper Canada remained unsecularized—an odious survival of ecclesiastical privilege.

A succession of ministries of short duration and of precarious tenure carried on the government while a larger national unity was rapidly maturing. In these changing ministries Sir Allan MacNab (q.v.), Sir Etienne Pascal Taché (q.v.), Sir Georges E. Cartier (q.v.), Sir John A. Macdonald (q.v.), Robert Baldwin (q.v.), George Brown (q.v.), Sir Francis Hincks (q.v.), Augustin Norbert Morin (q.v.), Sir Antoine Aimé Dorion (q.v.), Thomas D'Arcy McGee (q.v.), and John Sandfield Macdonald (q.v.) were the most prominent members. In the transitional and troubled state of the province no political party was strong enough to oppose successfully the reform of abuses originating in antiquated custom or in religious prejudice; and in 1854 the seigniorial tenures were abolished and the clergy reserves were secularized. In the same year a reciprocity treaty, negotiated with the United States mainly by the tact and persistence of Lord Elgin, brought a large volume of trade which lasted for 11 years.

The difficulties of administration grew greater as the wealth and population of Upper Canada increased. Government was practically reduced to deadlock by the firm persistence of each of the united provinces in its rights and aspirations, and by its protest against the hampering Act of Union. The American Civil War, nearing its close in 1864, supplied motives for union which accentuated the alertness of the most capable leaders. The Trent Affair (q.v.), the certainty that the reciprocity treaty would be abrogated, the unfriendly attitude of the British government towards the North, and an apprehension of possible retaliation after the close of the war, combined to influence statesmen in all the larger and more influential British North American colonies to view the question of union in its largest aspect. Already the Maritime Provinces of Nova Scotia, New Brunswick, and, later, Prince Edward Island were deliberating on federation; and in the Province of Canada Sir John A. Macdonald and George Brown, laying aside political opposition and personal enmities, united to impart a strong impulse to the movement. In 1864 a convention of delegates representing the various provinces was held at Quebec for the purpose of considering the advisability of union, and under the leadership of Sir John A. Macdonald adopted a set of resolutions, which served as the basis of the British North America Act passed by the British Parliament in February, 1867. Under this act Upper and Lower Canada, Nova Scotia, and New Brunswick were formally united as the Dominion of Canada. Newfoundland refused to enter the

union and still continues to hold herself aloof. (See CANADA, *Government*.)

The formation of the Dominion relegated local questions to the control of local legislatures, but at first the national outlook resulting from it was obscured by sectional distrust and opposition. Lord Monck (q.v.) was appointed the first Governor-General, and the first Premier was John A. Macdonald, whose administration was a coalition intended to recognize the self-sacrificing efforts of Liberal and Conservative statesmen who had sunk their antagonisms in a desire to accomplish federation. Nova Scotia, deeming herself brought into the union by a vote of her legislature which was contrary to the will of the people, started a movement for repeal, its chief spokesman being Joseph Howe (q.v.), a statesman who had long before contemplated a project of union on the largest scale. An overwhelming vote against the Dominion was given by the province at the first general election held in August, 1867, and Howe headed a delegation to London pledged to repeal. The British government, which had already accepted the principle of Canada's control of her domestic legislation, would not reconsider the provisions of the British North America Act and discountenanced the movement for repeal, which was finally eliminated by financial aid to the province and a seat for Howe in the Dominion cabinet.

In this opening time of adjustment the government was hampered by an electoral system which allowed a member of the Dominion House of Commons to sit also in the legislature of his province, a defect remedied by the abolition of dual representation. The greater achievements contemplated were the rounding out of confederation by the admission of the remaining provinces and the acquisition and organization of the Northwest Territories; also the cementing of the political fabric by railways. Among the inducements which led New Brunswick and Nova Scotia to join the union was the agreement, incorporated in the British North America Act, to unite these provinces with Quebec and Ontario by a railway, a promise which was fulfilled by the completion of the Inter-Colonial Railway in 1876. The admission of British Columbia in 1871 was likewise effected by the offer of the Dominion to build within 10 years a railway connecting that province with the eastern part of Canada. Prince Edward Island, which at first peremptorily rejected union as outlined in the Quebec Resolutions, was compelled later by financial stringency to reconsider its advisability, and in 1873 joined its fortunes with those of the larger provinces.

Of commanding importance was the acquisition of the vast region known as Rupert's Land and the Northwest Territories, the great "Lone Land" famed in exploration and discovery, over which one of the greatest of historic monopolies, that of the Hudson's Bay Company, had held governmental and proprietary rights since 1670. It was one of the first questions to command the concern of the government, and in 1868 a deputation was sent to England to purchase the company's rights and effect the transfer of the territory. After difficult negotiations, which formed the basis of British and Canadian statutes, the company in November, 1869, surrendered its chartered rights and interests for £300,000, reserving one-twentieth of a fertile belt whose boundaries were defined, and also blocks

of land at the different trading posts. Government measures to take legal possession of and organize this region, designated the "Northwest Territories" by the Act of 1869, were destined to a rude shock. In the Red River settlement, a district now included in Manitoba, a considerable population of half-breeds of French and Indian origin looked upon the Canadian officials, surveyors, and bridge builders as intruders upon their rightful lands, and prepared for active resistance. Hon. William McDougall (q.v.), the Lieutenant Governor appointed to inaugurate the authority of the Dominion, was prevented from passing beyond the United States boundary line, and Louis Riel (q.v.), a half-breed leader of undoubted gifts, but a fanatic subject to religious delusions, became the head and dictator of a so-called provisional government. The suppression of the rebellion and the creation of the Province of Manitoba, with its admission into the Dominion, followed in 1870. The name of Fort Garry, the trading post where Riel had his seat of "government," was changed to that of Winnipeg, a place of strategic importance in the development of a vast grain region and destined to a phenomenal growth. Districts were subsequently created out of the Northwest Territories as follows: Keewatin, in 1876; Assiniboia, Saskatchewan, Alberta, and Athabasca, in 1882; and Ungava, Mackenzie, and Franklin, in 1895. From the districts created in 1882 the provinces of Alberta (q.v.) and Saskatchewan (q.v.) were constituted in 1905. The extension of the boundaries of Manitoba, Ontario, and Quebec in 1912 included the larger part of Keewatin and all of Ungava. The Northwest Territories (q.v.) now include the districts of Mackenzie, Franklin, and part of the former district of Keewatin.

A notable event in which the first administration of Sir John Macdonald participated was the procuring of a settlement by the Treaty of Washington (q.v.) of several outstanding disputes between Great Britain, the United States, and Canada concerning fishing rights, part of the Oregon boundary, the Alabama claims, and losses due to the Fenian raids of 1866 and 1870-71. The British government, in response to the solicitations of the Dominion cabinet, made overtures to the Washington government which were received in a friendly spirit, and also appointed Sir John Macdonald as one of the commissioners to conduct the negotiations and sign the treaty. (See ALABAMA CLAIMS; SAN JUAN BOUNDARY DISPUTE; FISHING LAWS, *International Aspect*.) The Dominion's contract with British Columbia began the true epic of Canadian railway building, though Sir John Macdonald, in striving to fulfill the terms, committed the fault of receiving large sums of money for election purposes from Sir Hugh Allan (q.v.) in return for the contract with the latter to construct the projected Canadian Pacific Railway. Macdonald resigned before a parliamentary vote on the charges against him could be given, and the Governor-General, the Earl (afterward Marquis) of Dufferin (q.v.), intrusted Alexander Mackenzie (q.v.), leader of the Liberal Opposition, with the task of forming a new administration, which was sustained by a very large majority in the general elections. Mackenzie took the helm of government at a time of deep business depression, aggravated by a tariff which permitted the easy entrance of American manufactured goods into an almost paralyzed market. Moreover, by a policy of piecemeal construction of the Cana-

dian Pacific Railway, he angered British Columbia to the point of a threatened withdrawal from confederation. In the meantime Macdonald, seizing the opportune moment, offered the "National Policy" of protection to Canadian industries and in 1878 regained power. From that year until his death, in 1891, he held the premiership. A protective tariff was established, the Canadian Pacific Railway was completed in 1885, and in the same year a rebellion of half-breed settlers in the Saskatchewan valley, again under the leadership of Louis Riel (q.v.), was suppressed by military force. The efforts of the Liberals to regain power by a varying policy of closer trade relations with the United States were unsuccessful at two general elections, but after Macdonald's death the Conservative party began to disintegrate. None of his successors in the premiership, Sir J. J. C. Abbott (q.v.), Sir John Thompson (q.v.), Sir Mackenzie Bowell (q.v.), and Sir Charles Tupper (q.v.), could stay the steady decline of the party's standing in the country. Quarrels in the cabinet and corrupt practices in the administration of the Department of Public Works hastened the disintegrating process, and the general elections of 1896 returned the Liberals to power under the leadership of Wilfrid (afterward Sir Wilfrid) Laurier.

The period of Liberal ascendancy lasted for 15 years and was one of remarkable economic development and a parallel growth in national self-confidence. These features of progress were naturally emphasized in relation to Britain and the United States, with whom the greater part of Canadian trade is done; but notable also was the recognition of the newly won importance of Canada among the nations of Europe and even in the remoter field of African and Asiatic affairs. Laurier grasped the long-delayed opportunity of proving Liberal loyalty to Britain, which had been aspersed in many election campaigns and in a section of the Canadian press; but his eagerness was perfectly consistent with a policy which combined Canadian supremacy in Canadian affairs with the demand that, if aid were given to the mother country and Canadian statesmen were called to her councils, a voice in determining the amount and direction of that aid should be granted to the colony. While this was his known policy, there were no hard and fast lines in applying it, as was shown by the attitude of the Dominion in the South African War (q.v.). The prompt dispatch of Canadian troops, soon followed by a regiment of horse equipped by Lord Strathcona (q.v.), High Commissioner of the Dominion in London, proved the spontaneity of the colony's loyalty, in whose enthusiasm the dissenting voices in Quebec were practically lost.

The economic development during the Liberal régime was based partly on a tariff policy which, though lowering duties on some manufactured articles and on the necessities of life, did not repudiate the principle of moderate protection to Canadian industries; and partly on new domestic enterprises and the vigorous reaching out for trade with different countries. In harmony with this were the development of new lines of telegraphic and steamship communication. A notable feature was the favor shown to British interests. The famous British preference of 1897 granted a reduction which in three years became 33½ per cent on important classes of British manufactured goods. The strong feeling

in favor of making, so far as Canada could contribute to that end, the British Empire self-sustaining in trade, communication, and defense was voiced by Liberal statesmen and by none more emphatically than by the Premier himself. The sincerity of these professions was proved, first, by the Canadian government's assumption, in September, 1905, of the defense of Halifax, whose British garrison was replaced by Canadian troops; again, by the maintenance of Esquimalt, on the coast of British Columbia, as a naval station; permitting British forces to withdraw; and also by Canadian coöperation with Imperial plans of defense proposed at councils in London. In return Britain denounced commercial treaties with Belgium and Germany, in order that Canada might be free to make a preference.

The settlement of outstanding differences between the United States, Britain, and Canada was strongly favored by Laurier. In 1898 the Anglo-American Joint High Commission, appointed for that purpose, met first at Quebec and afterward at Washington, but its deliberations were interrupted by disagreement on the Alaskan boundary. Notwithstanding the friendly feeling which promoted the appointment of the commission, there had been a change in the attitude of the Canadian government concerning reciprocity with the United States. Formerly deputations from Ottawa to Washington in behalf of freer trade assumed the frequency and solicitude of some pilgrimages; but with the Laurier administration there was in this behalf neither frequency nor solicitude. The persistent refusal of the Washington government to listen to proposals for reciprocity had produced its natural effect. Also great enterprises absorbed the public attention and stimulated the public spirit to the submergence of economic fears. The Grand Trunk Pacific Railway, a government transcontinental line, had begun to be built; the Canadian Pacific had largely increased its mileage; and the Canada Northern, a private enterprise conducted with remarkable vigor and prudence, was a third line of railway designed to span the continent from the Atlantic to the Pacific. See *Transportation and Communication*.

Economic progress was further assured by a fortunate conjunction of the hour and the man. Clifford Sifton (q.v.), Minister of the Interior in the Laurier cabinet, conceived a plan of advertising the rich vacant lands of Canada, which was a stroke of administrative genius, and brought the desirability of a free Canadian home to the notice of scores of thousands in Europe, who had never considered such a possibility. American settlers who had a keen perception of agricultural values began to cross the border in large numbers. The result of Sifton's work was a tide of immigration which revealed to the world the potential wealth of the Canadian Northwest (see *Population*). The appointment in 1904 of Earl Grey as Governor-General did much to promote Imperial feeling in Canada. His enthusiasm for the welfare of the people and his keen insight into the possibilities of the country made him remarkably popular—a result all the more unusual from the fact that his public appearances and addresses were in strict conformity with the somewhat neutral functions of his office.

In 1907 the Dominion entered on the development of foreign relations, in that it apparently assumed the position of sharing with the Im-

perial authorities the conduct of negotiations with Japan. This arose primarily from the inclusion of Canada in the commercial part of the treaty of alliance between Japan and Britain, but more immediately from the riots in 1907 in Vancouver, B. C., which were a protest against Japanese immigration and labor competition. They were, however, a violation of that part of the treaty which gave equal privileges of residence in either country to the citizens of the other. Also they were insults to the subjects of a sovereign ally of Britain. The Canadian government, having arranged with the Imperial authorities that Rodolphe Lemieux, a member of the Laurier cabinet, should be allowed to act as envoy according to his own discretion, though in conjunction with the British Ambassador at Tokyo, dispatched Lemieux on his mission. The result was an agreement with the authorities at the Japanese capital that Canada would prevent further aggressions upon subjects of the Emperor, while the latter agreed to restrict the emigration of his subjects to Canada. The mission of the Canadian envoy was notable for the practical independence exercised by the Dominion in settling a matter of Imperial foreign policy.

In the same year advantageous commercial treaties were made with France and Mexico. Also the Lemieux Act, a labor law designed to facilitate the conciliatory interference of government for the elimination of strikes and lockouts, was passed and proved to be so successful as to earn both hearty Canadian and American commendation. In July, 1908, the tercentenary of the founding of Quebec was celebrated with much pomp, including a series of historic pageants and the presence of a large body of Canadian troops. Britain, the United States, and France sent distinguished representatives. The death of King Edward VII and the accession of George V in 1910 drew forth renewed manifestations of loyalty to the throne, and in the same year the establishment of a department of naval service and the projected building of a fleet of Canadian cruisers attested the purpose of the Dominion to assist Britain in naval defense. Much concern, not to say alarm, had been shown in regard to German naval competition with Britain. The naval programme of the administration aroused some opposition in Quebec, but the Conservative party lent it a provisional support until later developments changed its attitude.

The reciprocity issue was revived in 1910 on the initiative of the United States, and after interviews between President Taft and Canadian representatives an agreement was reached early in 1911, but it was definitely repudiated in the election of that year. The Liberals were decisively defeated and Robert Laird Borden (afterwards Sir Robert Borden), leader of the Conservatives became Premier. The Borden government gave the country a vigorous war administration, and Canada played a memorable part in the Great War, but there was a strong opposition to certain of the war measures on the part of the Liberals, especially of those who represented the French element. A violent opposition to conscription arose in 1917, and there was fear of popular revolts in the province of Quebec. A Coalition Cabinet including Liberals who supported the government's war policy was formed in October. In the election of December, 1917, which turned

largely on the question of the draft, the Coalition or Union government* was successful though Quebec was almost solidly for the Liberal leader, Sir Wilfrid Laurier. After the war in the presence of labor difficulties and other problems of readjustment the Borden government gradually lost power. In July, 1920, Sir Robert Borden resigned and was succeeded by Mr. Arthur Meighan who also became the leader of the Conservatives. Meanwhile, in 1919, the Liberals had chosen as their leader, Mr. William Lyon Mackenzie King after the death of Sir Wilfrid Laurier. In the elections of December, 1921, in which the Conservatives stood for a strong protective tariff policy, they were completely defeated and Mr. Mackenzie King became prime minister.

The governors-general of the Dominion have been Lord Monck, 1867-68; Lord Lisgar, 1868-72; Earl of Dufferin, 1872-78; Marquis of Lorne, 1878-83; Marquis of Lansdowne, 1883-88; Lord Stanley of Preston (Earl of Derby), 1888-93; Earl of Aberdeen, 1893-98; Earl of Minto, 1898-1904; Earl Grey, 1904-11; Duke of Connaught, 1911-16; Duke of Devonshire, 1916-21; Lord Byng of Vimy, 1921—.

The boundary line between Canada and the United States, which was determined with considerable vagueness by the Treaty of 1783, has formed the subject of much controversy between the United States and Great Britain, and was not finally settled for the northeast until 1842 (see WEBSTER-ASHBURTON TREATY; BARING, ALEXANDER) and for the northwest until 1846. (See NORTHWEST BOUNDARY DISPUTE; OREGON, History.) The question of the Alaskan boundary was rendered acute by the discovery of gold in the Yukon region. It was settled by an international commission in 1903 on terms that aroused keen dissatisfaction in Canada. (See ALASKA, Boundary Dispute.) The question of the right of the Americans to fish in Canadian waters has also been the subject of considerable controversy between the two governments (see SEALING; FISHING LAWS, International Aspect), as has also the right of the Canadians to participate in the seal fisheries in Bering Sea. See BERING SEA CONTROVERSY.

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CANADA, LOWER. See QUEBEC.

CANADA BAL/SAM, or **CANADA TURPENTINE.** A kind of turpentine obtained from the Balm of Gilead fir (*Abies or Picca balsamea*), a native of Canada and the northern parts of the United States. It is a greenish yellow, transparent liquid, having an agreeable odor, resembling that of turpentine, and a bitterish, acrid taste. When freshly exuded from the tree, it has the consistency of thin honey; on exposure to the air, however, it gradually dries up, forming a solid, transparent mass. Canada balsam is an oleoresin, consisting of 20 to 30 per cent of a volatile oil, and 70 to 80 per cent of a solid, composed mainly of two varieties of resin. It is the finest kind of turpentine obtained from any of the coniferæ, and was formerly employed for medicinal purposes, particularly as a stimulant for the cure of mucous discharges, and as a detergent application to ulcers. It is now used for a variety of purposes in the arts—as an ingredient in varnishes, in mounting objects for the microscope, in photography, and by opticians as a cement, particularly for connecting the parts of achromatic lenses to the exclusion of moisture and dust. Its value for optical purposes is very great, and depends not only on its perfect transparency, but on its possessing a refractive power nearly equal to that of glass.

CANADA CLERGY RESERVE. See POLITICAL PARTIES, *Canada*.

CANADA HEMP. See DOGBANE.

CANADA JAY, POR/CUPINE, etc. See JAY; PORCUPINE; ETC.

CANADA SNAKE/ROOT. See ASARABACCA.

CANADA THISTLE. See THISTLE.

CANADIAN LITERATURE. A classification which includes the writers, both French and English, who are connected with Canada by birth or residence. The expression is open to some objection, but has been adopted for the sake of convenience. The literature designated "Canadian" has two currents which can never unite in a main stream. Its productions are divided into two classes, each amenable to its own standard of popular appreciation and literary judgment. French Canada, comprising, with respect to language and literature, the Province of Quebec and the overflow of its population into eastern Ontario and the Canadian Northwest, together with the descendants of the Acadians in the Maritime Provinces, continues the traditions of Old France, reproducing especially the religious and social conservatism of the north and northwestern portions from which French-Canadians came. English Canada has a history and traditions which are less dependent upon the example of the mother country and encourage the formation of distinct literary types with local variants that reflect an independent spirit answering to the political genius of

the race. The goal of the French-Canadian writer is the crown of the French Academy; the Canadian writer of English, while hoping that his work may live, perforce abides the decision of a slower though less arbitrary tribunal.

French Canada. Canada was first settled by the French, who established their largest colonies in the valley of the St. Lawrence. A Jesuit college was established in Quebec in 1635, a year before the founding of Harvard. Four years later an Ursuline convent was opened, and later in the century Laval, the famous Bishop of Quebec, founded the seminaries which have since developed into Laval University, the chief seat of Roman Catholic learning and culture in Canada, and one of the most influential on the continent. The first books, written by explorers and Roman Catholic missionaries, naturally deal with travel, discovery, and contact with the Indian life which was to play a memorable and tragic part in the early history of French Canada. Samuel Champlain (q.v.), the founder of Quebec (1608), published many admirable narratives, beginning with a description of his first voyage (1599-1601). His works, frequently issued in Paris during the seventeenth century, were carefully edited by Laverdière (6 vols., Quebec, 1870). Lescarbot (q.v.), who bore a part in the settlement of Port Royal (Annapolis, N. S.), published the interesting *Histoire de la Nouvelle France* (Paris, 1609; republished by the Champlain Society, Toronto, 1912), to which was added a collection of poems called *Les muses de la Nouvelle France*. Other works produced under the French régime are Gabriel Sagard's *Grand voyage* (Paris, 1632); Pierre Boucher's *Mœurs et productions de la Nouvelle France* (Paris, 1864); the narratives of missionary adventure known as the *Relations des Jésuites*, edited, with Eng. trans., by R. G. Thwaites (71 vols., Cleveland, Ohio, 1896-1901); La Potherie's *Histoire de l'Amérique septentrionale depuis 1534 jusqu'à 1701* (4 vols., Paris, 1722); the Jesuit Lafitau's *Mœurs des sauvages américains* (Paris, 1724); and Le Clercq's *Établissement de la foy* (2 vols., Paris, 1691; Eng. trans. by J. G. Shea, New York, 1881). Charlevoix (q.v.), a Jesuit traveler, is the last of the line of these early writers, and his *Histoire et description générale de la Nouvelle France* (3 vols., Paris, 1744; Eng. trans. by J. G. Shea, 6 vols., New York, 1866-72) is a work of high merit. Taken altogether, the books of French priests and officials form a body of historical narrative and personal adventure unequalled in interest and style by anything produced elsewhere in America during the same period.

Of equal importance, as springing from the folklore in which the poetic genius of French Canada lay enshrined, were the songs which the Breton and Norman peasant brought with him from the old land and which in course of time became imbued with the scenery and spirit of the new. Whether sung at the fireside of the *habitant* on the banks of the St. Lawrence, or carried afar to the north and west by *coursier de bois* and *voyageur*, these songs voiced the deepest feelings, sustaining and gladdening the heart. Orally transmitted from generation to generation, they were written down at a later period, and a collection of them, *Les chansons populaires du Canada*, was edited, with music, by Ernest Gagnon (Quebec, 1865). A translation was made by William McLennan under the title *Songs of Old Canada* (Montreal, 1886). One of

the most beautiful is the famous love song, with interlocked stanzas, beginning "À la claire fontaine." Like "Le pont d'Avignon," it is a transplanted flower of purest primitive French poetry. The music and verse of such old songs now fill an humbler but no less cherished part in French-Canadian life. Though less known than before to race patriotism and race politics, they soothe the remoter village dweller and the toiler in field and furrow with memories springing from life in Normandy and Brittany of more than two hundred years ago, when the daily round of the lowly was not widely different from that of the Quebec *habitant* to-day.

When Canada passed under British rule by the Treaty of Paris (1763), the French spirit in the colony responded instantly to the summons for a contest of civilizations, when the armed struggle which had been going on for 150 years was changed to political rivalry under one flag. The French language and civil and religious rights were preserved, though the conflict did not cease until Confederation in 1867, and has echoes to-day among the Nationalists in the Province of Quebec. French Canada, awakened by the change of 1763, produced her first native-born writers, among them several historians of their country. The earliest was Michel Bibaud, with the *Histoire du Canada sous la domination française* (Montreal, 1837), and the *Histoire du Canada sous la domination anglaise* (Montreal, 1844). A third volume of his history appeared in 1878, some years after Bibaud's death. In 1845 appeared the first volume of the famous *Histoire du Canada* by François Xavier Garneau (q.v.) which was finished in 1852. Though written with great ability and with distinction of style, Garneau's work is largely a plea for and vindication of his race, and lacks the impartiality of history, though regarded by the French as their standard authority. Among the influences that emphasized the resolute and contentious attitude of French Canada there should be mentioned the fiery speeches of Louis Joseph Papineau (q.v.), whose eloquence responded to the aspirations of his compatriots in their favorite literary form. Other notable histories were written by J. B. A. Ferland, a priest and professor of Laval University; the Abbé Faillon, a Sulpician, of French birth but long resident in Canada; Louis Turcotte, of the library of the Quebec Legislature; Benjamin Sulte (q.v.), journalist and poet; the Abbé H. R. Casgrain (q.v.), a brilliant though sometimes prejudiced writer, whose *Pèlerinage au pays d'Évangéline*, a defense of the exiled Acadians, was crowned by the French Academy in 1888; and the Abbé Tanguay, sometime professor of archæology in Laval University and author of the *Dictionnaire généalogique des familles canadiennes*, a work of immense learning and research. Thomas Chapais, eminent as an orator and publicist, wrote admirable monographs on *Jean Talon* (1904) and *Montcalm* (1911). The latter is a fine tribute of historical justice to a hero who has suffered in the estimation of his compatriots less for his faults than for his honorable defeat.

French-Canadian writers have excelled in the essay, the biography, the descriptive sketch, and in political and literary criticism. Faucher de Saint-Maurice, who served in Mexico under Maximilian, wrote *De Québec à Mexico. Les Provinces Maritimes*, and many other volumes of de-

scription. Etienne Parent, the first editor of *Le Canadien*, was a writer of much distinction and power on economic, religious, and philosophic questions. Sir James MacPherson Le Moine wrote a large number of legendary and historical sketches, together with scientific monographs, both in French and in English, as *L'Ornithologie du Canada* (1860); *Quebec Past and Present* (1876); *Canadian Heroines* (1887); *Le premier gouverneur anglais de Québec* (1891); and *The Avi-Fauna of the Province of Quebec* (1902). Arthur Buies, the editor of several journals, published numerous volumes of popular *chroniques*, beginning in 1871, besides *Le Saguenay et la vallée du Lac Saint-Jean* (1880) and *L'Outaouais supérieur* (1889). Laurent Olivier David, journalist and senator, is considered by many to be the most brilliant of contemporary prose writers in the Province of Quebec. Independent in politics, an outspoken opponent of clerical interference in elections, as was proved by his *Le clergé canadien* (1896), a subtle and lucid exponent of contemporary life and character in French Canada, his works command a high degree of admiration. His *Patriotes de 1837-38* (1884) and *Les deux Papineau* (1896) are a defense of the French-Canadian rebellion of 1837. He has also written *Biographies et portraits* (1876); *Mes contemporains* (1894); *Laurier et son temps* (1905); and *Vingt biographies* (1910). Among other essayists and biographers trained in the school of journalism are Alfred Duclos DeCelles and Narcisse Eutrope Dionne. The former in 1896 gained the highest prize of the French Academy of Political and Moral Sciences for his *Etats-Unis: origine, institutions, développements*. He later wrote other historical and political works and contributed biographies of Sir Louis Hippolyte Lafontaine and Sir Georges Etienne Cartier to the *Makers of Canada Series*. The latter's *Life of Jacques Cartier* (1889); *Life of Samuel Champlain* (1891 et seq.); *Québec et Nouvelle France* (1909), and other historical works are written in lucid and finished style. The names of Joseph Charles Taché, Joseph E. Cauchon and Hector Fabre are famous in French-Canadian journalism. Later but equally eminent as journalists are Henri Bourassa, also notable as an orator; Omer Héroux, and the Abbé J. A. Damours. During the first 14 years of the twentieth century the number of journalistic and historical writings relating to French Canada greatly increased, but it is impossible here to do more than refer the reader to the biographies in this work and the bibliography to this article. Splendidly dramatic and of international recognition was the epitome of French-Canadian history presented in the Quebec Tercentenary pageants and celebrations of 1908, a complete and vivid account of which was given by the Abbé Joseph Camille Roy (b. 1870), a professor in Laval University, in *Les fêtes du troisième centenaire de Québec* (1911).

In fiction the pioneer work is Philippe de Gaspé's *Les anciens canadiens* (1863), which faithfully mirrored the old régime when *seigneur, curé, censitaire, and voyageur* mingled in a life of feudal loyalty, religious zeal, and stirring adventure, shocked often into rare heroism by an appeal for protection or by the imminence of massacre. De Gaspé was succeeded in the same field by Joseph Marmette, who wrote *François de Bienville* (1870), which passed through several editions; *L'Intendant Bigot*

(1872); *Le chevalier de Mornac* (1873); and *La fiancée du rebelle* (1875). P. J. O. Chauveau (q.v.), in his *Charles Guérin, roman de mœurs canadiennes* (1852), had attained a measure of success, as had also the poet Léon Pamphile Le May (b. 1837). A. Gérin-Lajoie's *Jean Rivard* (1874), dear to the heart of the French-Canadian farmer who reads it, portrays the struggles and success of a young man who, with professional honors and a city life within his reach, is suddenly confronted with the burden of caring for his fatherless brothers and sisters, and manfully assumes the life of a *habitant*, winning their sustenance and his own from the soil. Among later notable novels may be mentioned Jules Paul Tardivel's *Pour la Patrie* (1895), a religious novel with a purpose; Dr. Choquette's *Claude Paysan* (1899); Madame Laure Conan's *L'Oublié* (1902), crowned by the French Academy; Napoléon Bourassa's (b. 1827), *Jacques et Marie*, recalling the dramatic story of the exiled Acadians; Chief Justice Sir Adolphe B. Routhier's *Le centurion: roman des temps messianiques* (1909), a religious tale of great beauty and power; and Hector Bernier's *Au large de l'écueil* (1912).

In poetry, Joseph Quesnel and Joseph Mermet, who came from France in 1779 and 1813 respectively, strongly influenced the literary life of French Canada in the opening stages of its development. Quesnel, whose versatile muse was exercised in poem, epistle, epigram, hymn, and song, also produced a prose comedy, *Colas et Colinette*, and *L'Anglomanie*, a comedy in verse satirizing the affectation of English manners and customs in the upper classes of French-Canadian society during 1800-15. Mermet, a lieutenant in De Watteville's regiment which was prominent in the War of 1812, sang of the deeds of that conflict, notably the victory of Châteauguay; but he excelled also in poetic description, and his verses on Niagara, said to be the first written on that subject by a Canadian, have the merit of being no less poetic than precise. Nevertheless Quesnel and Mermet were only in part Canadian in spirit and product. To quote the words of Abbé Camille Roy, of Laval University, we see in them "the expression of the French muse, which has become Canadian for a brief period. In their poems, too, we see a reflection—dim though it be—of those light, graceful, terse forms of poetry, frequently idyllic, that flourished in France during the eighteenth century." Michel Bibaud, the historian, and Denis Benjamin Viger should be mentioned among the poets whose work was worthily aspiring during this formative period.

The name of Octave Crémazie ranks first in the arduous period between the Union of 1841 and Confederation in 1867. Intensely patriotic, his poems touched the popular heart with scenes and events stirring the elemental emotions that centre on love of country and the Roman Catholic faith. They were collected and published with an introduction by the Abbé Casgrain (Montreal, 1882). Among the best known are the elegy on *Les morts*; the ode to the first Bishop of Quebec, Laval; and, above all, the noble lines of *Le drapeau de Carillon*, celebrating the victory of Montcalm over Abercrombie and Howe at Ticonderoga. Léon Pamphile Le May, already mentioned as a novelist, wrote some fine lyrics of patriotism published in his *Essais poétiques* (1865). Also his translation of Longfellow's *Evangeline* (1870) won for

him a name far beyond his own country, while his *Les vengeances* (1875) was notably well received, and his poem on *Champlain* (1908), graced the Tercentenary celebration at Quebec. Benjamin Sulte, the historian, became equally well known as a poet by his *Les Laurentiennes* (1870) and *Les chants nouveaux* (1880). Adolphe Poisson's *Chants canadiens* (1880), *Heures perdues* (1894), *Sous les pins* (1902), and *Le sommeil de Montcalm* (1910) display deep poetic feeling; but his work, like that of P. J. O. Chauveau, Louis Fiset, and even Nérée Beauchemin, whose delicate art and subtle melody within the limited range of *Les floraisons matutinales* (1897) taxed the resources of critical praise, had not the breadth and power to compel more than provincial recognition. Louis Frechette surpassed all other Canadian poets in the ability to write both for French Canada and Old France. His *Les fleurs boréales* (1880) and *Les oiseaux de neige* (1880) were crowned by the Academy, though the poet without that aid would have become known and read in his mother country. In *La légende d'un peuple* (1887), an epic celebrating great characters and episodes in French-Canadian history, he reaches his highest level; notwithstanding occasional rhetorical exaggeration, thought and language are fused into the passion, strength, and high seriousness of great poetry. William Chapman's *Les aspirations* (1904) and *Les rayons du nord* (1910) were both crowned by the Academy. The Abbé Gingras, in the poems and songs entitled *Au foyer de mon Presbytère* (1881), belongs to the poetic school of Octave Crémazie. Alfred Garneau (1836-1904), son of the historian, in his volume entitled *Poésies*, proved his possession of subtle poetic art and delicacy of feeling. Albert Ferland's *Le Canada chanté* (1908) adds one more to the number of poetic tributes to the old régime. Among the younger writers there is, however, a noticeable tendency to seek for material in new poetic veins, whether in their own introspective imaginings or in symbolism and the legendary themes of Europe. In illustration of the former may be mentioned Albert Lozeau's *L'Âme solitaire* (1907), Louis J. Doucet's *La chanson du passant* (1908), and Jean Charbonneau's *Les blessures* (1912); of the latter, Paul Morin's *Le paon d'émail* (1911) and the poems of Emile Nelligan, a gifted youth whose career was cut short by insanity in 1905 at the age of 19. The latter two naturally belonged to the poetic school whose master was Leconte de Lisle.

English Canada, settled by English, Irish, Scotch, and Germans, was really built up by the 40,000 or more United Empire Loyalists who left the United States at the close of the Revolutionary War. Some settled in Nova Scotia, and others founded New Brunswick and Upper Canada (now Ontario). As in the case of the French in Lower Canada, or Quebec, the first writers were explorers and historians. Samuel Hearne (born in London in 1745) made three voyages of exploration, under the auspices of the Hudson's Bay Company, traveling 1300 miles on foot to the Great Slave Lake. After his death appeared his *Account of a Journey from Prince of Wales's Fort in Hudson's Bay to the North-West* (1795; republished by the Champlain Society, Toronto, 1912). Alexander Mackenzie, entering the service of the Northwest Fur Company, pushed beyond the Great Slave Lake down the river now bearing his name to

the Arctic Ocean, and later crossed the Rocky Mountains to the Pacific. The narrative of these two perilous explorations was published under the title *Voyages on the River St. Lawrence and through the Continent of North America to the Frozen and Pacific Oceans* (1801; reprinted, New York, 1902). Equally important is Alexander Henry's *Travels and Adventures in Canada and the Indian Territories in 1760-1776* (1809). After heroic efforts and a bloody conflict, the Earl of Selkirk established a colony in the Red River valley, now the flourishing Province of Manitoba. While in Montreal he wrote his *Sketch of the British Fur Trade in North America* (1816). From Joseph Bouchette came two notable topographical descriptions of the Canadas (1815-32). The record of the adventures and explorations of these men and of Daniel W. Harmon, Paul Kane, and later, J. W. Tyrrell, who conducted an exploratory survey of nearly 5000 miles through the country lying between Great Slave Lake and Hudson Bay, is of the deepest literary interest. Tyrrell wrote *Across the Sub-Arctic of Canada* (1897; 3d ed., 1908). L. J. Burpee's *The Search for the Western Sea* (1907) is a fascinating narrative of travel and exploration. The earlier of these works were published in London; but by 1815 histories were beginning to issue from the Canadian press. We may cite William Smith's *History of Canada* (1815), and David Thompson's *War of 1812*. Interesting histories of that war were also written by Major John Richardson and Gilbert Auchinleck.

The struggle for responsible government in Upper Canada gave rise to a mass of controversial writing of a strongly partisan character, the Tory or oligarchical side being represented by Sir John Beverley Robinson and Bishop Strachan, and the Reform side by Robert Fleming Gourlay and William Lyon Mackenzie. After the union of the two Canadas in 1841 the struggle for responsible government was renewed, the literary protagonists on the Tory and Reform sides respectively being Egerton Ryerson and Robert Baldwin Sullivan, a brilliant and versatile Irishman who had risen to eminence in public life. The speeches of Joseph Howe, poet, journalist, and the greatest of Canadian political orators in English, were published in 1858. Howe was for many years a member of the Parliament of Nova Scotia, and was also editor of the *Nova Scotian*, for which he wrote two series of popular sketches, called "Western and Eastern Rambles" and "The Club." The former is based on observations made in travels through North America: the latter is an imitation of the *Noctes Ambrosianæ* (q.v.). To the *Nova Scotian* Thomas Chandler Haliburton, a native of Nova Scotia and a judge of the Supreme Court, contributed papers known as "The Clockmaker," or "Sayings and Doings of Sam Slick of Slickville" (1837). The hero is a Yankee peddler into whose mouth is placed much telling criticism. The sketches were widely read in America and England and were translated into several languages. Oddly enough, though the Canadian humorist has had few successors in his own country, he is the father of dialect humor in the United States. Haliburton also wrote the standard history of Nova Scotia and several books descriptive of his country.

The union of Upper and Lower Canada in 1841, and the subsequent federation of all the British provinces in North America except Newfoundland, mark a new era for Canada. A feel-

ing of nationality unknown in earlier times found impassioned expression in the verse of Charles G. D. Roberts, especially in the poem beginning, "O Child of Nations, giant-limbed!" The constitutional questions that came to the front after 1840 created a press which compares favorably with that of any English-speaking country. Of journalists, Goldwin Smith, who settled in Toronto in 1871, was known throughout the world for his work in political history and criticism; the editorial writings of George Brown were a potent factor in Canadian politics, as also were those of John Neilson and Robert Christie in the English journals of Quebec. Later journalists of eminence include such names as George Stewart, for some time editor of the *Quebec Chronicle*, William J. Rattray, Edward Farrer (b. 1850), sometime editorial writer on the *Toronto Mail* and the *Toronto Globe*, Sir Hugh Graham, Sir John S. Wilison, James A. Macdonald, and William F. Maclean, editor of the *Toronto World*. The speeches of the well-known statesmen Sir Charles Tupper, Alexander Mackenzie, Sir John A. Macdonald, Sir Alexander T. Galt, Edward Blake, Sir Richard Cartwright, and Sir Wilfrid Laurier form a body of political discussion of which much has an enduring literary character. Especially noteworthy is the bilingual oratory of the last-named statesman, who became not only the most eloquent speaker of his country in French and English, but created a new standard for his racial compatriots, combining the emotional appeal of the French-Canadian with the reasoned presentment of constitutional precedents and principles immemorably known in English-speaking legislatures.

In the larger English-Canadian histories, with few exceptions, the abundant material available does not receive an artistic setting. In Robert Christie's *History of Lower Canada* (6 vols., 1849-55) the narrative of British rule is brought down to the Union of 1841. William Kingsford's *History of Canada* (10 vols., 1887-97) is the standard work, accurate in the main, but with few attractions of style. John Charles Dent's *The Last Forty Years* (1881) begins with the Union of 1841 and is written with grace and lucidity, as is also his interesting *Story of the Upper Canada Rebellion* (1886). James Hannay's *History of Acadia* (1879) modifies commonly received notions of English cruelty in the expulsion of the French. Col. William C. H. Wood's *The Fight for Canada* (1904) has been pronounced the best historical work written in the Dominion. The history of the Canadian Northwest was narrated by Alexander Ross (1783-1856), Alexander Begg, George Bryce, and G. M. Adam. Smaller Canadian histories were written by John McMullen, George Bryce, W. H. Withrow, and Charles G. D. Roberts. Sir John Bourinot published several books on Canadian history, literature, and government. Alpheus Todd's (1821-84) *Parliamentary Government in England* (1867-69) and *Parliamentary Government in the British Colonies* (1880) are widely known. In the field of local historical research, Arthur George Doughty (in collaboration with G. W. Parmelee) is the author of a scholarly and authoritative work on the siege of Quebec. More widely known are his *The Fortress of Quebec, 1608-1903* (1904) and *The Cradle of New France* (1908). Alexander Begg and R. E. Gosnell wrote excellent histories of British Columbia.

Among essayists, biographers, and mis-

cellaneous writers are Nicholas Flood Davin, whose *Culture and Practical Power* was praised by Gladstone; S. E. Dawson, known for his fine study of Tennyson's *Princess* (1884), his *St. Lawrence Basin and its Border Lands* (1905), and *A Plea for Literature* (1908); Sir William Dawson, a geologist and naturalist, who aimed in many books to reconcile science and religion; Sir Daniel Wilson, an eminent archaeologist and literary critic, author of *Prehistoric Man* (1863; 3d ed., 1876), and *Caliban, the Missing Link* (1873); Rev. W. H. Withrow, author of *The Catacombs of Rome* and other books; Rev. G. M. Grant, author of *Ocean to Ocean* (1873), *Advantages of Imperial Federation* (1889), and of several other books; T. A. Haultain, author of brilliant literary brochures, as *A Critique of Cardinal Newman's Exposition of the Illative Sense*, *A Fragmentary Dialogue on Love and Religion*, *The Mystery of Golf*; J. Castell Hopkins, editor of *Canada; an Encyclopædia of the Country* (6 vols., 1897-1900), who wrote lives of Sir John Thompson, Gladstone, Queen Victoria, and Edward VII, besides many political pamphlets and articles; W. D. LeSueur, the author of notable essays on Matthew Arnold and Sainte-Beuve; Rev. John Maclean, whose books, as *Our Savage Folk* (1895), deal chiefly with the Indians; J. M. Oxley, the writer of delightful boy stories; and George Stewart, who wrote excellently of Alcott and Emerson. In philosophical criticism the writings of John Watson, and in politics and economics those of John Beattie Crozier, hold a high place.

The material progress and increased political importance of Canada since 1900 have gone far to change the quality and outlook of the literary product. Historical, biographical, and economic works have multiplied, the majority springing from a thoughtful consideration of Canada's new course of development, with its possibilities and dangers. In political biography the best works are Charles Lindsey's *Life and Times of William Lyon Mackenzie* (1862), Joseph Pope's *Memoirs of Sir John A. Macdonald* (1894), A. D. DeCelles' *Papineau and Cartier* (1904), John Lewis's *George Brown* (1906), Sir J. Bourinot's *Lord Elgin* (1905), Sir J. S. Wilson's *Sir Wilfrid Laurier* (1903), J. W. Longley's *Joseph Howe* (1905), Miss J. N. McIlwraith's *Sir Frederick Haldimand* (1904), and A. Shortt's *Lord Sydenham* (1908). These biographies, the majority of which are included in the *Makers of Canada Series* (Toronto), are in large part serious studies of constitutional principles whose historic background is not far removed from rebellion and bitter partisan struggle. Other works expressing conflicting views of Canada's present and future are *The Kingdom of Canada* (1908) and *The Kingdom Papers* (1911) by John S. Ewart, *The Struggle for Imperial Unity* (1909), by G. T. Denison, and *Essays in Politics* (1909), by Andrew Macphail. For a full list of authors and books on Imperial federation and allied political and economic problems, see the bibliography to this article, and CANADA.

The first Canadian novels depicted phases of the soldier's and settler's life. John Galt, a Scottish novelist who lived three years in Canada, published, on his return home, *Laurie Todd, or the Settlers in the Woods* (1830), giving graphic accounts of frontier life. Major John Richardson wrote *Wacousta, or the Prophecy* (1832), an exciting romance based on the siege of Detroit by

Pontiac. For nearly half a century following there was little or no Canadian fiction in English, until William Kirby, author of *The Golden Dog, a Legend of Quebec* (1877), opened a field from which some of his successors have abundantly reaped. James de Mille wrote *The Dodge Club* (1869), a humorous book of travel, and over 30 books of fiction, of which the best are *Helene's Household* (1868), *The American Baron* (1870), and the posthumous *A Strange Manuscript found in a Copper Cylinder* (1888). Mrs. Mary Catherwood in *The Romance of Dollard* (1889) and several other novels recalled stirring episodes of Canadian history. G. M. Adam's (in collaboration with Ethelwyn Wetherald), *An Algonquin Maiden* (1886), John Mackie's *Devil's Playground* (1894), and Mrs. K. E. Hayes's *Prairie Potpourri* (1895) are portrayals of Indian life and the far Northwest. Mrs. J. B. Hammond's *The Unexpected Bride* (1895) and Miss B. L. Macdonell's *Tales of the Soil* respectively treat of Canadian rural life and Canadian legends. Miss M. R. Charlton is said to have been a pioneer in the fairy tale with her *Wonder Web of Stories* (1892) and *With Printless Foot* (1894). Miss K. M. Barry depicted phases of modern life in Ottawa. Humor, inconspicuous in Canadian literature since Haliburton, reappeared in *The American Girl in London* and other novels of Mrs. S. J. Cotes, *The Major's Big Talk Stories* (1881) of F. B. Crofton, and with notable raciness and richness in the *Literary Lapses* (1910), *Nonsense Novels* (1911), and *Sunshine Sketches of a Little Town* (1912) by Stephen B. Leacock, professor of political economy in McGill University. In the *Madonna of a Day* (1896) Miss Lily Dougall drew a portrait of the modern woman. Equally brilliant is her *Beggars All* (1891). Tales and sketches by Mrs. S. F. Harrison, Miss R. Barry, Miss J. N. McIlwraith, Mrs. M. A. Sadlier, and W. McLennan depict various phases of Canadian life. Miss M. M. Saunders's *Beautiful Joe* (1894), the autobiography of a dog, had an immense sale throughout the United States, Canada, and Britain. Mrs. L. M. McDonald's (b. 1877) novels of Prince Edward Island life are widely read. Sir Gilbert Parker, working mainly in the vein of French-Canadian fiction opened up by William Kirby, ranks as the most distinguished Canadian novelist. Of other writers of fiction the most notable are C. W. Gordon (Ralph Connor), Agnes C. Laut, Ernest Thompson Seton (the nature writer), W. A. Fraser, Mrs. Leprohon (Rosanna Eleanor Mullins), Mrs. Catherine Parr Traill, Norman Duncan, William Douw Light-hall, and Arthur Stringer.

The earliest writers of English-Canadian verse are Oliver Goldsmith (a collateral descendant of the Irish poet and author of *The Rising Village*), Robert Sweeny, Adam Kidd, and Mrs. Susannah Moodie (d. 1885). Some of Mrs. Moodie's verses are found in the sketches entitled *Roughing it in the Bush and Life in the Clearings* (1853). Charles Heavysege is the author of a remarkable tragedy called *Saul* (1857). Other eminent names are Charles Sangster, Isabella Valancy Crawford, known for beautiful lyrics such as "The Master-BUILDER" and "The Axe of the Pioneer"; George Frederick Cameron, who wrote "What reck we of the creeds of men?"; Charles Mair; Archibald Lampman, a poet of great promise who, like G. F. Cameron, died young; C. G. D. Roberts, W. W. Campbell, Bliss Carman, Freder-

ick G. Scott, Sir Gilbert Parker, Duncan Campbell Scott, Joseph Howe, Sarah Anne Curzon, John Reade, Alexander McLachlan, Arthur Weir, John Hunter Duvar, E. Pauline Johnson, the gifted daughter of a Mohawk chief, and Marjorie L. C. Pickthall. Dr. W. H. Drummond's poems of the *habitant*, written in a dialect halfway between French and English, are unique and highly popular. Robert Service (b. 1876) wrote stirring ballads of struggle and adventure in the Far West and the Yukon Territory. A list of poets and writers of fiction will be found in the anthologies and other works of reference in the bibliography.

Bibliography. The scattered material for the history of French-Canadian and English-Canadian literature may be found in the published *Transactions of the Royal Society of Canada* (Ottawa, 1883 et seq.). The volume for 1893 contains a valuable paper by Sir J. G. Bourinot, "Canada's Intellectual Strength and Weakness," published in book form (Montreal, 1893). The volume for 1905 contains a list of publications ed. by Narcisse E. Dionne, from the beginning of Canadian history. Consult also: Henry James Morgan, *Bibliotheca Canadensis* (Ottawa, 1867) and *Canadian Men and Women of the Time* (Toronto, 1898; new ed., 1912); Edmund Lareau, *Histoire de la littérature canadienne* (1874); Philéas Gagnon, *Essai de bibliographie canadienne* (Montreal, 1895); C. G. V. ab der Halden, *Etude de littérature canadienne-française* (Paris, 1904); Horning and Burpee, *Bibliography of Canadian Fiction* (Toronto, 1904); *Canadian Annual Review* (Toronto, 1903 et seq.), which contains lists of Canadian authors and their latest works. For verse anthologies consult: Rand, *Treasury of Canadian Verse* (New York, 1900); Stedman, *Victorian Anthology* (Boston, 1895); Lighthall, *Songs of the Great Dominion*, "Windsor Series" (London, 1889), and *Canadian Poems and Lays*, "Canterbury Poets Series" (London, 1891); and Gagnon, *Chansons populaires du Canada* (Quebec, 1865). See CANADA; AMERICAN LITERATURE; ENGLISH LITERATURE.

CANADIAN PERIOD. See ORDOVICIAN SYSTEM.

CANADIAN POLITICAL PARTIES. See POLITICAL PARTIES, *Canada*.

CANADIAN RIVER. A river formed by the union of several branches flowing east from the Taos and Culebra range of the Rocky Mountains, at the border between New Mexico and Colorado, in Colfax Co., N. Mex., in long. 105° 20' W., and about 100 miles northeast of Santa Fe (Map: United States, Western Part, F 3). By local usage in New Mexico it is termed Red River. It flows nearly due south to lat. 35° 20' N., then east across the panhandle of Texas and into Oklahoma, where at Taloga it turns southeast, to a point about 6 miles south of Purcell, whence it flows east and northeast and joins the Arkansas River, of which it is the chief tributary, at Tamaha. It is nearly 900 miles long, but, owing to closely paralleling other rivers in the lower part of its course, it drains a relatively small territory. The volume of water varies greatly in the wet and dry seasons.

CANAIGRE, kà-nā'gēr (Fr.) (*Rumex hymenosepalus*). A tannin-producing plant related to the docks and quite resembling the sour dock. It grows wild in the southwestern United States. The stem is nearly smooth, often red-

dish in color, grows from 1 to 3 feet high, and terminates in a branched flower stalk. The leaves vary from about 2 to 16 inches in length. The roots are tuberous, somewhat resembling small sweet potatoes, and are clustered in an upright position 3 to 12 inches below the surface of the ground. The value of the plant consists in the amount of tannin contained in the roots. The tannin content in the air-dried tubers varies from about 10 to 35 per cent, a quantity exceeding that in any other tannin-producing plant. The rapid decrease in the supply of wild canaigre has caused its culture to be undertaken in the Southwest, but this enterprise has not assumed large proportions. It is propagated mainly from the roots, one ton being required to plant an acre. The land is prepared and cultivated as for other root crops. Harvesting may begin after the plant has made its full period of growth, but it has been found that the percentage of tannin increases as the roots lie dormant in the ground. In the wild state the plant makes its growth during the winter and early spring, and by early June has seeded and the tops are dead. About 15 tons of roots per acre is an average yield. The preparation for the market consists in slicing the roots and drying them in the sun. The extract obtained is especially adapted for tanning leather for uppers, fine saddlery, etc. Consult: *Arizona Experiment Sta. Bul.* 2 (1896).

CANAL (Fr., from Lat. *canalis*, water pipe). An artificial channel for water, constructed for drainage, irrigation, supplying water power, or purposes of navigation. The design and construction of canals of large size are much the same whatever their purpose may be. In this article the general questions of design and construction for all kinds of canals will be discussed, but for specific examples of canals for other purposes than navigation the articles on DRAINAGE, IRRIGATION, and WATER POWER should be consulted.

Design and Construction. The two points which have mainly to be considered in canal design are the cross section of the channel and its longitudinal profile. Considering the longitudinal profile first, it will readily be understood that a canal cannot, like a road or railway, adapt itself to the irregularities of the country by means of ascending and descending grades, but must consist of one or more practically level sections or reaches. When two or more reaches are required at different levels, the adjoining extremities of two reaches cannot be, for obvious reasons, connected by a grade in the channel. The various means for making such connections are described in the following section; but the fact which needs to be noted here is that, since the profile in the canal must consist of a series of level reaches at different elevations, care has to be exercised to select a route which will provide long reaches and consequently few changes in level. As in railway work, however, depressions in the ground may be crossed by embankments or other structures upon which the channel is carried.

Another matter which has to be carefully provided for is a supply of water to the highest reach, or summit level, as it is usually called; the reason for this being that this reach is constantly losing its water to the reaches below, and this loss must be supplied by streams or reservoirs so located as to discharge into the summit level. Distances being equal, a canal

which connects two points with a single reach is preferable to one with two reaches. Indeed, a considerable increase in length is allowable to permit the canal to be constructed without a change of level. The reason for this is that transferring a boat from one level to another by locks or the other usual means is a slow operation, and, furthermore, locks are very expensive to construct compared with a similar length of the ordinary channel. The engineer carefully integrates these factors of time and cost and selects the route between the various points he wishes to connect which will give the minimum time of transit at the minimum cost. In deciding upon the cross section to be given to the channel, two things have to be considered, viz., its dimensions and its form. As regards dimensions, they are determined largely by the size of the vessels with which it is proposed to navigate the canal. The width must be at least sufficient to permit two vessels of the largest size to pass each other without fouling. Another influencing factor is that the resistance to traction is greater in a restricted waterway. Elaborate trials made in Germany on the Dortmund and Ems Canal showed that while increase of water section diminished traction resistance and injury to the banks, increase of depth was more beneficial than increase of breadth.

It is generally assumed that a width of bottom equal to twice the beam of the largest vessel navigating the canal regularly is necessary in order to permit of two boats passing, and that the depth of water should be about $1\frac{1}{2}$ feet greater than the draft of these vessels, if good results are to be obtained, though this may vary from a few inches to 4 feet or more, as in the case of the Suez Canal, or even a greater amount, as in the Panama Canal. The form of the cross section is determined very largely by the material through which the channel is cut, and by the location of the channel under certain circumstances. The bottom of the channel is always made flat; in soft ground the sides are made sloping, the angle of slope depending upon the stability of the material, being quite steep in firm materials and quite flat in unstable materials; and in rock the sides are made vertical or nearly so. The attempt is always made, for the sake of economy of excavation, to approach as nearly to a rectangular cross section as the conditions will permit. When the canal passes through towns, the sides are made vertical to save space and provide quays, retaining walls being used in soft ground to form vertical sides.

Canal construction consists chiefly of open-cut excavation, but embankments, aqueducts, tunnels, culverts, bridges, and a variety of other construction work may be involved. The plant used and methods adopted in excavating canals depend very largely upon the size of the canal section and the material encountered. In rock the practice is the same everywhere, and consists in the use of power drills and explosives for breaking up the rock, and derricks, conveyers, and cars hauled by animal or mechanical power for removing it. In a boat canal of small section, the plant required is small and simple, but in large ship-canal sections very large and powerful machinery and elaborate power plants supplying compressed air and electricity are employed. In small canals soft-ground excavation was commonly performed by means of shovels and plows for loosening the material, and scrapers and carts for carrying it from the ex-

cavation, but now power shovels are almost invariably used, as well as grading and excavating machines, the steam shovels loading into carts or cars hauled by horses or light locomotives. In ship canals of the largest section this plant is still further enlarged by the employment of special excavating and conveying machines and powerful dredges, both hydraulic and bucket or clamshell. Aqueducts are usually built in the form of masonry-arch bridges with the top formed into a channel for the water. Sometimes, however, masonry piers carry a wooden trough or, in later years, one of steel. In embankments the channel is formed by building up the sides and lining the bottom and slopes with concrete or a layer of clay or other impervious material. Tunnels for canals are built in the same manner as tunnels for other purposes. (See TUNNEL.) Culverts are provided for carrying streams underneath the canal and bridges for carrying highways and roadways over it. See BRIDGE; CABLEWAY; CRANE; DRILL; QUARRY.

Locks, Inclines, and Lifts. The usual methods of transferring vessels from one level or reach of a canal to another one are by locks, inclines, or lifts. Of these three devices, the lock is the one most extensively employed. A lock is a masonry chamber built at the junction of the two reaches, the bottom of which is a continuation of the bottom of the lower reach and the top of which is at the same level as the banks of the upper reach. Structurally this chamber consists of two parallel masonry side walls, closed near each end by a pair of folding gates or, more rarely, by sliding or lifting gates. When a vessel is passing from the lower reach to the upper reach through a lock, the sequence of operations is as follows: the lower gates being open and the water in the lock being at the same level as the water in the down reach, the vessel is floated into the lock chamber and the down gates are closed. By means of valves in the upper gates or culverts in the side walls or floor of the chamber, water from the upper reach is slowly admitted until the water levels in the chamber and in the upper reach are the same. The upper gates are then opened and the boat floated out into the upper reach to continue its journey. To lock a vessel from the upper reach to the lower reach, the operations described are merely reversed. The gates are usually made of wood or iron, and each leaf consists structurally of two vertical posts called the quoin post and the mitre post, connected by horizontal frames, which serve as a framework for carrying the water-tight boarding or plating. The quoin post has pivots at top and bottom which work in suitable fittings in the side wall, so that each gate leaf swings open and shuts like a door.

A gate consists of two leaves, the swinging edges of which meet on the centre line of the chamber; but as each leaf is somewhat wider than half the width of the chamber, they do not form a straight diaphragm across the chamber when closed, but are shaped like a very flat letter V with its point projecting towards the upper level or reach. This construction gives greater strength to resist the pressure of the water. The height between the bottom of the down reach and the bottom of the upper reach is called the lift of the lock. The practicable height of lift in lock construction is limited, and where great differences in level have to be over-

come, a series or flight of locks built end to end is employed.

Where a vessel passes through a lock from one level to another, a lockful of water is lost from the upper level to the lower level for each pair of boats passed. Where water is scarce and the total lift is large, therefore, resort is sometimes had to inclined planes up and down which the boats are transported in cradles or tanks running on wheels and hauled by cables or other power. Inclined planes for canals are of very early origin, being at one time quite extensively used for high lifts, and some of these old inclines on American canals are described in the following section, though these canals are now abandoned. In Europe they are still encountered, as the Grand Junction, England; at Ourcq, France; Shropshire, England; and Oberland, Germany.

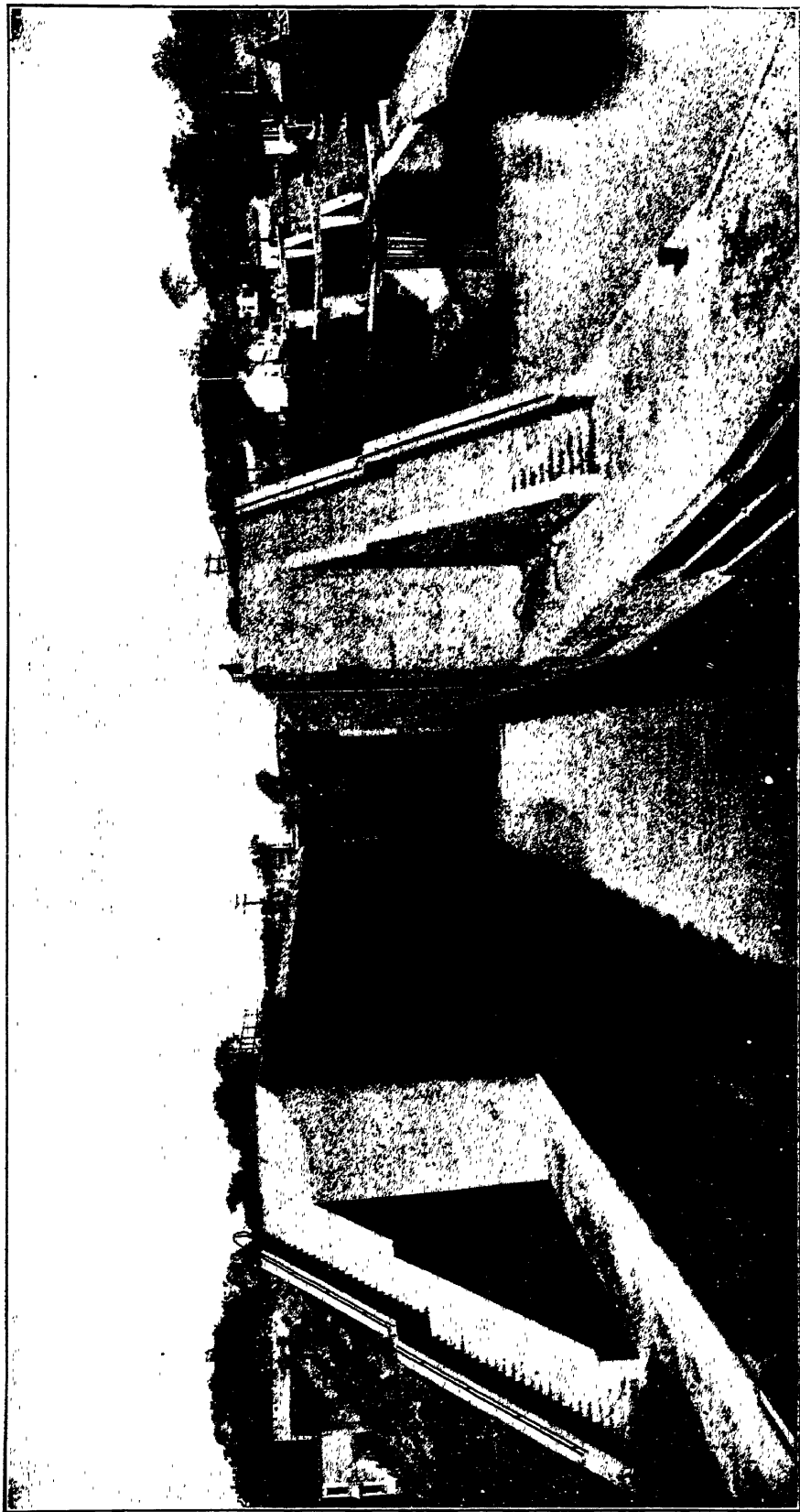
A more important system of transferring canal boats from one level to another is the vertical lift or lift-lock system, which has been installed in a number of places and is proposed for several other places where very high and important differences of level occur. In the vertical lift-lock system the boat is floated into a movable trough, the ends of which are closed by gates, while similar gates close the ends of the canal approaches. When the gates are closed behind the boat, the trough is raised or lowered, as the case may be, until it coincides with the other level of the canal, when the front gates are opened and the boat proceeds upon its way. The trough is raised and lowered by means of hydraulic or other power, aided sometimes by counterweights or flotation tanks. The first vertical lift on a large scale was that built at Auderton, England, on the Trent and Mersey Canal, in 1875, and operated for several years with hydraulic machinery until in 1908 the plunger and hydraulic appliances were removed and each tank was counterweighted separately and the machinery was operated by electricity; a second was built at Les Fontinettes, France, on the Neuffossé, in 1885; a third at La Louvière, Belgium, in 1888; and a fourth at Heinrichenberg, Germany, in 1895. In 1895 a lift lock was designed to replace the flight of locks at Lockport, N. Y., on the Erie Canal. In 1904 an hydraulic lift lock was built at Peterborough, Canada, on the Trent Canal, and in 1906 another at Kirkfield on the same canal. The Heinrichenberg lift lock on the Dortmund and Ems Canal in Germany has a tank $229.6 \times 28.2 \times 8.2$ feet, with a lift of 52.45 feet.

Boat Canals. History.—Canals date from a period long anterior to the Christian era and were employed as means of navigation and communication by the Assyrians, Egyptians, Hindus, and Chinese. The royal canal of Babylon was built about 600 B.C. As an interesting instance of canal construction, previous to the fifteenth century, may be mentioned the Grand Canal of China, built in the thirteenth century to connect the Yang-tze-kiang and Pei-ho. This canal is 650 miles long; is largely composed of canalized rivers; is about 5 to 6 feet deep, and has inclined planes up which the boats are hauled by capstans and made to slide down a paved track. The lock is said to have been invented in 1481 by two Italian engineers, but the merit of this invention is also claimed by Holland. The known facts are that canal locks were used in both Holland and Italy in the fifteenth century, and that by their development a wonderful impetus was given to canal construction, which had

previously been confined to such countries as permitted canals of a single level or reach to be used. The first European country to take up the construction of navigation canals on a systematic plan and extensive scale was France. The Briare Canal, connecting the rivers Seine and Loire, was built from 1605 to 1642; the Orléans Canal was built in 1675, and the Languedoc Canal in 1666-81. For the time this last was an enormous work—the canal connecting the Bay of Biscay with the Mediterranean by an artificial waterway 148 miles long and $6\frac{1}{2}$ feet deep, with 119 locks having an aggregate rise of 600 feet, and capable of floating vessels of 100 tons. In Russia a great system of canals connecting St. Petersburg with the Caspian Sea was developed during the eighteenth century; a canal connecting the North Sea and Baltic, 100 miles long, was finished in 1785. The Gotha Canal, 280 miles long, connecting Stockholm and Gothenburg, in Sweden, was completed in 1832; and the Danube and Main Canal, 108 miles long, was constructed 1836-46. France, however, was the continental country which devoted the greatest attention to canal construction. Notable among recent works is the Marseilles-Rhône Canal, begun in 1904 and to be finished about 1918. It will be 48 miles long (approx.), 82 feet wide, 8 feet 2 inches to 9 feet 10 inches deep, with locks $52\frac{1}{2}$ feet wide and 525 feet long, and will cost about \$20,000,000. Barges of 600 tons can be accommodated. Under the Nerthe range will be a \$10,000,000 tunnel $4\frac{1}{2}$ miles long, the greatest of its kind. Marseilles, gaining direct water communication with the interior of France and northern Europe, expects to become the chief clearing house for the North African trade. It will be declared a free port, like Hamburg, which has long depended greatly on a network of canals. France now has upward of 3000 miles of canal and 2000 miles of canalized rivers.

Germany has spent much effort in developing its canal systems recently, and it was estimated in 1912 that the Rhine and Weser Canal then under construction would have a traffic capacity of 17,000,000 tons annually. Standard forms and sizes of barges of 600 tons and 400 tons capacity have been adopted as most advantageous after elaborate experiments. The former are 213.25 feet in length, 26.25 feet in beam, and draw loaded 5.74 feet of water. The 400-ton barges were 180.44 feet in length, but with other dimensions the same. Lock systems to accommodate barges of this size were recommended where they did not exist. In Belgium there has been a marked tendency to increase the dimensions of existing canal systems, so that, for example, the lower portion of the canal from Charleroi to Brussels extending from Clabecq to the latter city may accommodate 1000-ton boats. The countries of continental Europe continue to manifest considerable activity in enlarging and extending their boat-canal systems, while England and America have practically abandoned the development of their systems of navigable waterways. In Great Britain the boat canals have been criticized as being absolutely lacking in uniformity of management or design and dimensions and, generally speaking, being incapable of being worked by steam. Furthermore, the system of tolls has been unequal, and with the development of railways little thought has been given to the consistent evolution and increase of a natural canal system.

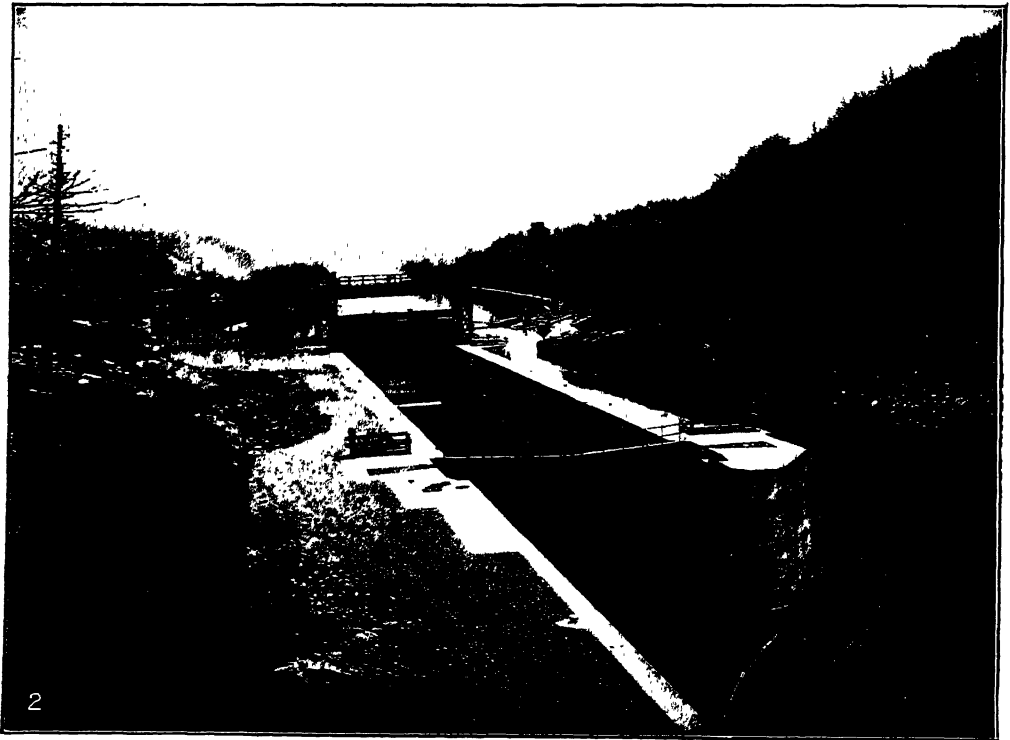
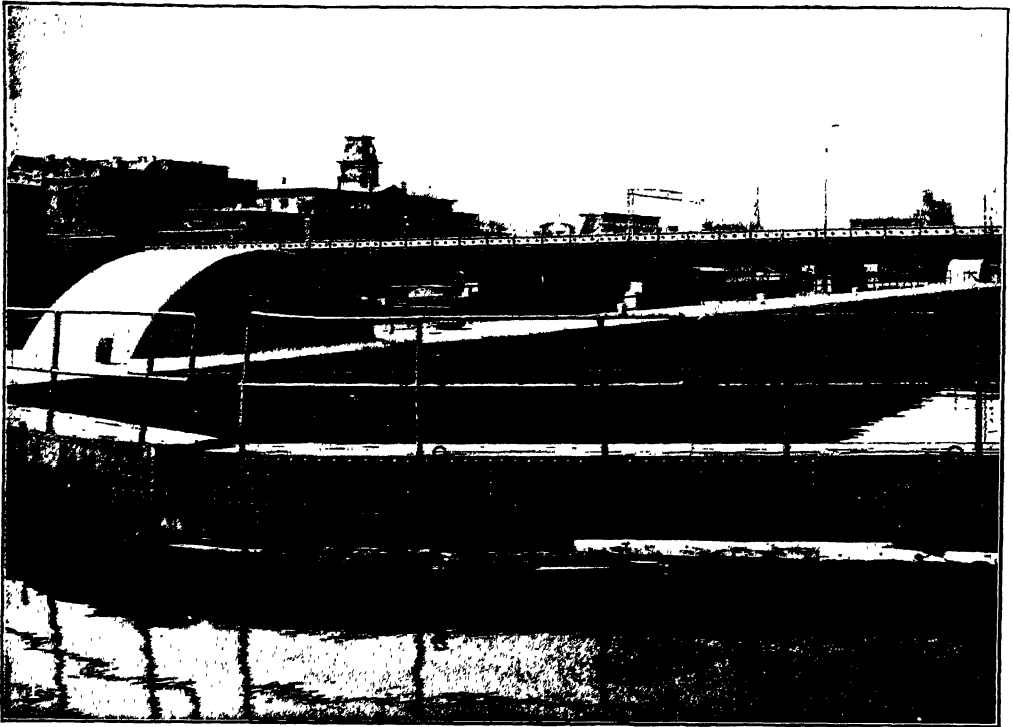
CANALS



THE NEW YORK STATE BARGE CANAL

LOCK No. 2 AT WATERFORD, THE EASTERN TERMINUS OF THE ERIE CANAL. This is the first of a series of high lift locks located within about a mile and a half, with a combined total lift of 169 feet, the greatest flight of high lift locks in the world. Three locks of the older canal may be seen on the right.

CANALS



THE NEW YORK STATE BARGE CANAL

1. **SIPHON LOCK AT OSWEGO.** The First Siphon Lock to be built in the United States, and the only lock of this type on the Barge Canal.
2. **HIGH LIFT LOCK AT LITTLE FALLS.** A Lock with a lift of $40\frac{1}{2}$ feet, with a lift type lower gate. The only instance of a lift gate on any Barge Canal lock except the guard locks at the Genesee River crossing.

The first canals in Great Britain are generally conceded to have been the Foss dike and Caes dike in Lincolnshire, 11 and 40 miles long respectively, the former of which is still navigable. These channels are stated to have been first excavated by the Romans and to have been enlarged in the twelfth century. It was not until the latter part of the eighteenth century, however, that canal building assumed importance in England through the energy and liberality of the Duke of Bridgewater and the skill of the engineer, James Brindley, the success of whose works stimulated others to engage in similar undertakings. The era of canal building, ushered in by the Duke of Bridgewater by the construction of the Bridgewater Canal in 1761, continued until 1834, when the last inland boat canal was built in Great Britain. It is interesting to note that from 1791 to 1794 speculation in canal shares became a mania in England and finally resulted in a financial crash and the ruin of many persons. At the end of 1834 there were about 3800 miles of canal in Great Britain, of which about 3000 miles were in England. The following may be mentioned as among the more notable of the British canals: Grand Canal, Dublin to Ballinasloe, Ireland, 164 miles long, 40 feet wide, 6 feet deep, built in 1765; Royal Canal, Dublin to Torinansburg, Ireland, built after the Grand Canal; Gloucester and Berkeley Canal, Sharpness to Gloucester, 17 miles; Caledonian Canal, crossing Scotland, 17 feet deep; Forth and Clyde Canal, 35 miles long and 10 feet deep; and the Crinan Canal across the peninsula of Kintyre, 12 feet deep. The depth of the great majority of British canals, however, varies from 3½ feet to 5 feet, and many of these are now owned by the railways. Various schemes to increase the facilities for internal waterways have been considered by parliamentary and other commissions, but beyond reports and discussions little has resulted.

In the United States the construction of the Erie Canal, begun in 1817, opened up the development of canal construction, which now aggregates upward of 4500 miles, located mostly in New York, Pennsylvania, Ohio, Illinois, Indiana, and Virginia. The first man who really saw the future of canal communication was George Washington, whose main efforts, however, were directed towards the connection of the Chesapeake and the Ohio River, but in 1808 Secretary Gallatin submitted a report recommending an extensive system of waterways, on which, however, no action was taken. Canal building continued active in the United States until about 1837. After this date attention was turned chiefly to railway construction. Space is not available here to trace the development of the canal system of the United States in detail, but the essential facts respecting some of the more important enterprises will be given. In 1793 a canal was built around the rapids of the Connecticut River at South Hadley, Mass., and another, 3 miles long, was built around Turners Falls on the same stream in 1790-96. The canal at South Hadley is interesting as being the first canal built in America, and as having the two levels connected by an incline, up and down which the boats were raised and lowered in a tank or caisson filled with water and propelled by cables operated by water wheels.

The Erie Canal, connecting the Hudson River at Albany and Troy with Lake Erie at Buffalo,

is 363 miles in length. It was begun in 1817 and completed in 1825, at a cost of \$7,602,000. Its construction was due chiefly to the foresight and energy of De Witt Clinton. The enterprise was undertaken and carried through by the State of New York, Clinton being Governor during nearly all the period of its progress. As its route lay chiefly through an uninhabited wilderness, it opened for settlement an immense territory. It was subsequently enlarged, until it was 70 feet broad at the surface and 56 feet at the bottom, with a depth of 7 feet. The canal was immensely successful, contributing largely to the growth of New York, Buffalo, and intermediate places, and serving for many years as the great artery of passenger as well as freight traffic between the northeastern sections of the United States and the newly settled States of what was then the West. Light packet boats, drawn by frequent relays of horses, which were made to proceed at a trot, made the trip from Albany to Buffalo in three and a half days. In 1896 it was estimated that the cost of construction and improvements had aggregated \$52,540,800. An expenditure of \$9,000,000 more for enlargement was authorized by popular vote in that year. Work was begun on this enlargement in the winter of 1896-97 and resumed again during the winter of 1897-98. In the spring of 1898 all of the \$9,000,000 had been consumed and only a part of the projected deepening to 9 feet was completed. See **ERIE CANAL**.

New York State Barge Canal. In 1900, in response to a demand for increasing the capacity of the Erie Canal and other waterways of the State of New York, an investigation was set on foot to determine the cost and proper plan for its enlargement so that boats or barges of 1000 to 1200 tons could be used. By laws enacted in 1903 an appropriation of \$101,000,000 was made to cover the cost of deepening and extending the canal system of the State. This involved the improvement of the Erie, Oswego, and Champlain canals, making a waterway 12 feet in depth and aggregating 431 miles, of which 27 miles was lake navigation, where Oneida, Onondaga, and Cross lakes were utilized. Forty-three per cent of the entire mileage was to have a minimum bottom width of 75 feet and the remainder not in lakes was to be constructed in canalized rivers and streams with a bottom width of channel ranging from 110 to 200 feet. If the full width of the locks that were constructed for the canal should be utilized, boats of 3000 tons could be accommodated, but for boats that could pass in the most restricted channels and be driven tandem or lifted together at one lockage a capacity of about 1600 tons was as much as could be provided for. The economic value of the New York State Barge Canal during its construction was a matter of considerable dispute, but it presented many interesting engineering problems which will be found discussed under **NEW YORK STATE BARGE CANAL** (q.v.).

The Illinois and Michigan Canal connects Lake Michigan and the navigable waters of the Illinois River, and allows the passage of vessels of limited size from the Gulf of Mexico to the Gulf of St. Lawrence by using also the Welland Canal, which forms a navigable channel from Lake Erie to Lake Ontario. In 1825 it was estimated that the canal, about 100 miles in length, would cost about \$700,000, but nothing definite was attempted till 1836, when estimates

were made for a canal 60 feet wide at the bottom and 6 feet deep, costing \$8,654,000. Work was commenced in June, 1836, and continued until March, 1841, when it was discontinued for want of available funds. In 1845 an additional \$1,800,000 was raised by the sale of lands owned by the canal. In consequence of a change of plans the entire cost fell within the estimates which had been made, so that at the opening of the canal in April, 1848, the entire expenditure had been \$6,170,226. When completed, the eastern terminus joined the south branch of the Chicago River, 5 miles from the mouth of the main stream. A direct line is pursued to the valley of the Des Plaines, the main eastern branch of the Illinois River, a distance of about 8 miles. The canal then traverses the valley to the mouth of the Kankakee River, a distance of 43 miles, passing through the towns of Lockport and Joliet and receiving water from four feeders—the Calumet, Des Plaines, Du Page, and Kankakee rivers. The canal now follows the valley of the Illinois River to its terminus, La Salle, passing through the towns of Morris and Ottawa, receiving water from Fox River; the whole length being 96 miles. From La Salle traffic can pass through the Illinois River to Grafton on the Mississippi, which has been improved by locks and dams by the national government and by the State of Illinois. The water at La Salle is 145 feet lower than Lake Michigan, and the descent is accomplished by means of 17 locks, varying in lift from $3\frac{1}{2}$ to 10 feet. The locks are 110 feet long and 18 feet wide, giving passage to boats of 150 tons. The canal, on account of its small dimensions, is inadequate for traffic conditions, and its volume of business is small.

Chicago Sanitary and Ship Canal. Lake Michigan is also connected with the Mississippi by the Chicago Sanitary and Ship Canal, completed in 1900. (See CHICAGO DRAINAGE CANAL.) This canal, 28 miles in length, was originally designed to carry the drainage of Chicago to the Mississippi instead of to Lake Michigan. It has a minimum depth of 22 feet, a width at the bottom of 160 feet, and a width at the top varying from 162 to 290 feet. The canal extends from the Chicago River in Chicago to Lockport, where it joins the Des Plaines River. It has been proposed to deepen the Chicago Drainage Canal and also the Illinois and Mississippi rivers, and construct locks so that barges and light-draft vessels can pass direct from the Great Lakes to the Gulf of Mexico; but the use of the water from the Great Lakes whereby their level may be lowered has been opposed by the national government. In 1913 there was put under construction a smaller canal extending from South Chicago to Sag Bridge, where it joined the Chicago Drainage Canal. This canal was designed to reverse the flow of the Calumet River and take care of the drainage of a rapidly growing district.

Besides the Erie and the Illinois and Michigan, the other large canals of the United States are the Delaware and Hudson (now abandoned), at one time the great coal route to New York from the Pennsylvania mines, 102 miles long, completed in 1820, cost \$6,946,455; the Chesapeake and Ohio, 185 miles, cost \$11,375,000; the Schuylkill Coal and Navigation Company's Canal, 108 miles, cost \$13,207,000; and the Wabash and Erie in Indiana, 274 miles, cost \$6,000,000. There were 13 canals in New York, 14 in Pennsylvania, 5 in Ohio, 4 in Virginia, 2 in

New Jersey, and 1 each in Delaware, Maryland, Indiana, Illinois, and Michigan, but now most of these are in disuse.

Chesapeake and Ohio Canal. This waterway originated in a project formed by Washington as early as 1774, to make the Potomac navigable from tidewater to Cumberland, and to connect it by common roads and portages with the affluents of the Ohio west of the Alleghanies. The War of the Revolution postponed the scheme, but in 1784 it was again broached by Washington, and Maryland and Virginia appointed a joint commission, with him at the head, to investigate the subject. The result was the incorporation of a company to make the Potomac navigable from the tide-water to the highest possible point by the construction of such locks as might be necessary for that purpose. Of this company Washington was the president until his election as President of the United States compelled his resignation. The project encountered many obstacles, until at last, in 1820, it was abandoned as impracticable, when the Board of Public Works of the State of Virginia took steps which led to the organization of a new company, which constructed the Chesapeake and Ohio Canal from Georgetown to Cumberland, completing it in 1850. It passes through the Potomac valley to Paw Paw Bend, from which point it passes through the mountains by a tunnel 3118 feet long. The whole length of the canal is 184 miles, its depth 6 feet, its width to Harper's Ferry 60 feet at the surface and 42 feet at the bottom. By means of 74 locks 100 feet long and 15 feet wide, an elevation of 609 feet is gained. All the water is supplied from the Potomac. At Georgetown the canal was led over the Potomac by means of a great wooden aqueduct bridge. The cost of the work was over \$11,000,000.

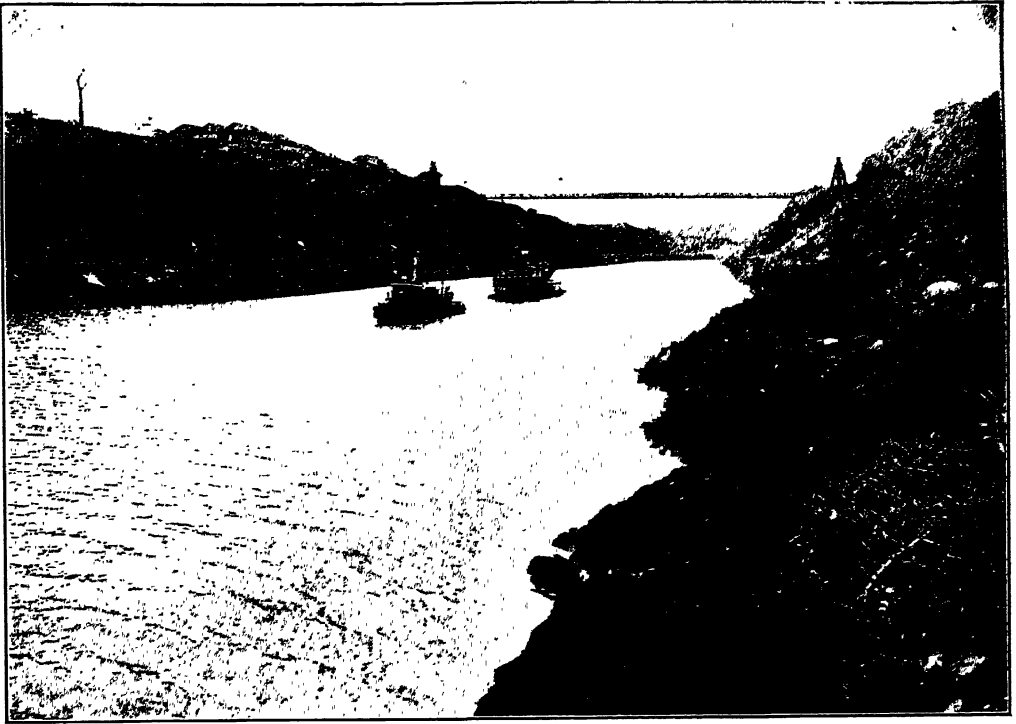
The Morris Canal connected the Delaware at Phillipsburg, N. J., with the Hudson at Jersey City. It was 102 miles long and accommodated vessels of 80 tons. An interesting feature of this canal was the use of inclines for connecting the different levels; there were 23 of these inclines, with an average rise of 58 feet.

These canals in many cases, however, played a prominent, if often a brief, rôle in the development of the commerce of the United States, and their history is well worthy of consideration.

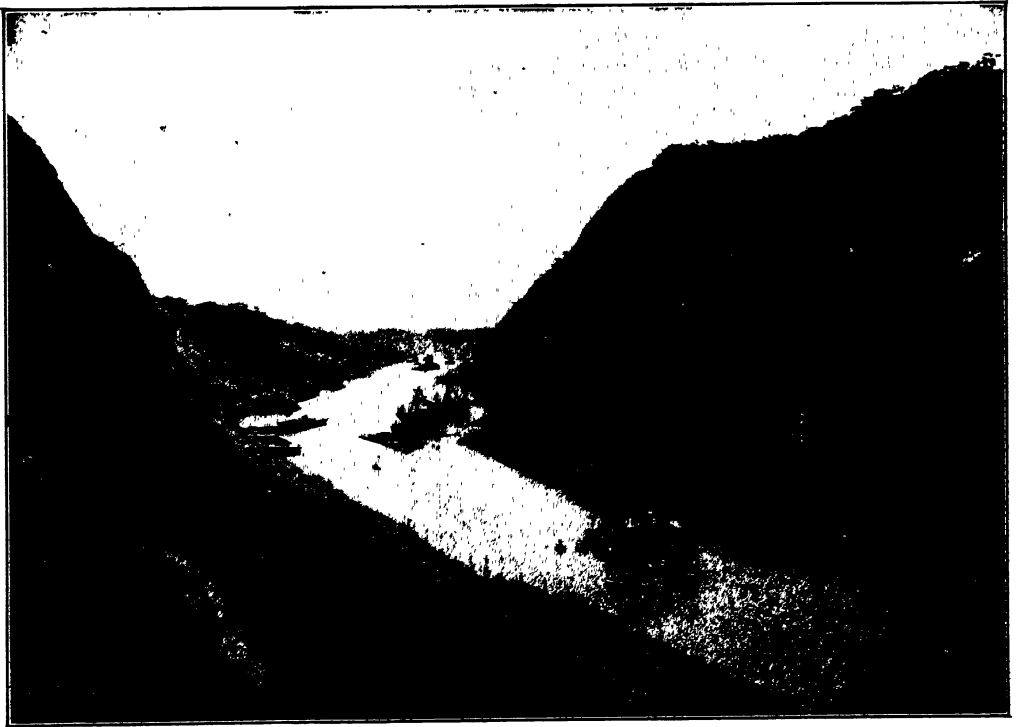
Hennepin Canal. The only boat canal, strictly speaking, constructed in the United States since 1850 is the Illinois and Mississippi, or Hennepin, Canal in Illinois. This canal was begun in July, 1892, and it was completed in 1908, costing about \$75,000,000. It was designed as a short route from the upper Mississippi River to Lake Michigan in connection with the existing water routes of Illinois. It extends from the Illinois River at Great Bend, $1\frac{1}{4}$ miles from Hennepin, Ill., to Rock Island, Ill., 77 miles, of which 50 miles are canal and 27 miles are slack-water navigation down the Rock River. The canal proper and the summit-level feeder are 7 feet deep and 80 feet wide at water level. The feeder is 34.75 miles long. There are 37 concrete locks, 35×70 feet, with lifts of from 3 to 10 feet.

Proposed Canals in the United States. The advocates of an extensive system of canals in the United States, and especially a system of coast waterways consisting of canals connecting the various sounds and bays along the Atlantic seaboard, have not been discouraged with the lack

CANALS



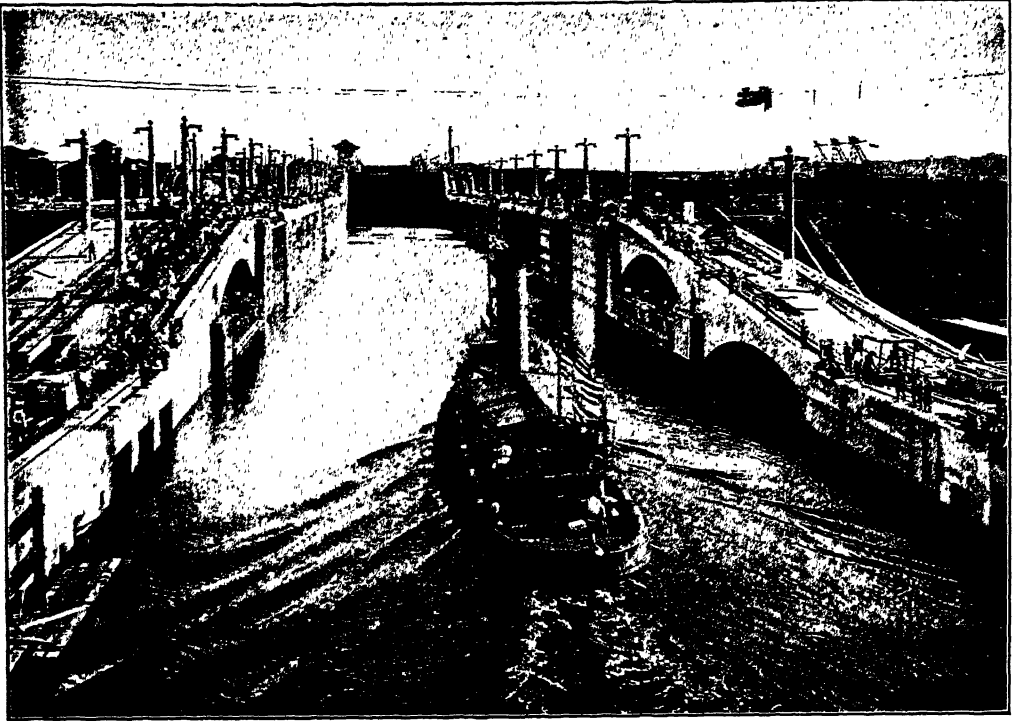
CULEBRA CUT. Looking north from east bank between Culebra and Empire. Tug towing first ladder dredge to operate in Canal. October 22, 1913.



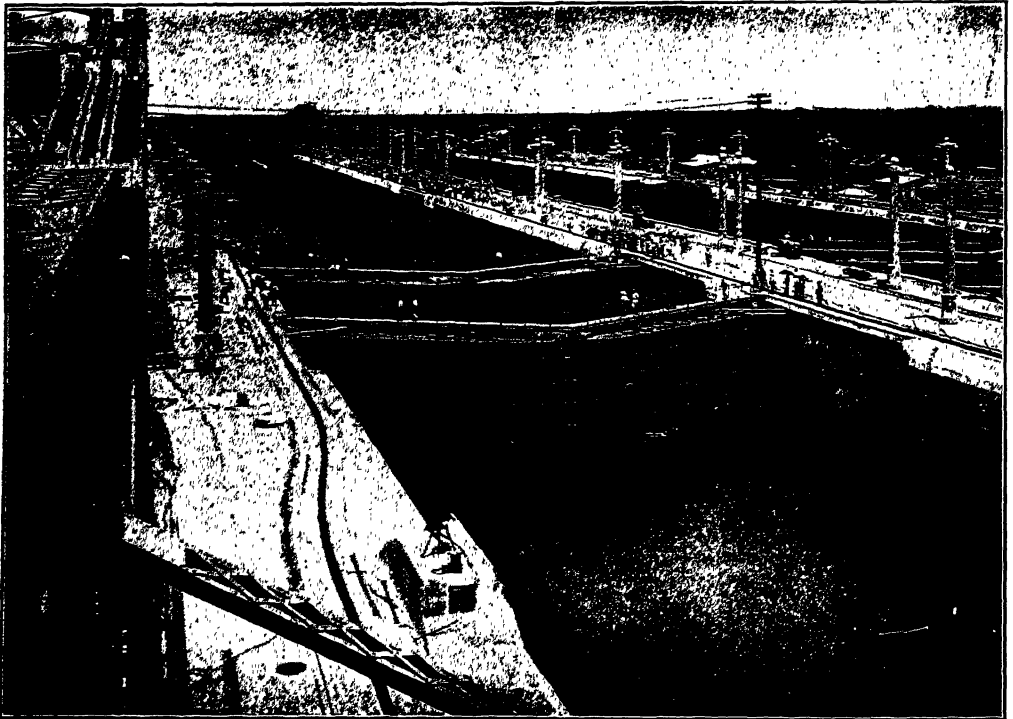
CULEBRA CUT, CULEBRA. Looking north from west bank. Dredges excavating at Cucaracha slide and channel at that point 150 feet wide. December 15, 1913.

PANAMA CANAL

CANALS



OPERATION OF GATUN LOCKS. First boat through. Tugboat "Gatun" entering lower lock, west chamber. Looking south from forebay. September 26, 1913.



OPERATION OF GATUN LOCKS. Dredging fleet entering upper lock, west chamber. Looking north. Water 45 feet above sea level. October 9, 1913.

PANAMA CANAL

of success attending such canals. Various schemes have been proposed in Congress, and numerous examinations and surveys have been authorized by the Corps of Engineers of the United States army. The River and Harbors Act of March 3, 1905, provided an appropriation for a survey "for the construction of a continuous waterway, inland where practicable, from Boston, Massachusetts . . . to Beaufort, N. C., for the purpose of ascertaining the cost of a channel with a maximum depth of 25 feet, or such lesser depths along any section . . . as may be found to be sufficient for commercial, naval, or military purposes"; and General Bixby, the Chief of Engineers, in 1913 presented a detailed report with estimates showing how a canal 12 feet in depth could be constructed that would give communication from Boston to Beaufort in connection with existing waterways. An appropriation was made by Congress in 1912 for the purchase of the Albemarle and Chesapeake Canal and for its improvement, and General Bixby recommended that \$30,000,000 be appropriated for carrying out the scheme. In addition to the commercial importance claimed for such a system of canals, the military value was also urged, as such waterways would be beyond the range of a hostile fleet attacking the coast.

After this brief account of canal construction in the United States, it is necessary to note that, all things considered, transportation by internal artificial waterways has been far from successful. Of some 4500 miles of canal constructed in the United States at an approximate cost of well over \$200,000,000, over half, or some 2500 miles, costing in all about \$80,000,000, have been abandoned. These abandoned canals failed entirely to compete with the railways or to serve any useful purpose. This was due, in many cases, to the improvident original location of the canals, to which often were added mismanagement and a lack of provision and control of strategic connections and terminals. This was emphasized all the more with the introduction of the railroad and the failure of the tow-path canals, as constructed, to lend themselves to modern conditions of mechanical transportation, such as steam, or electrical haulage of the boats, or barges. In the report of the Commissioner of Corporations on Transportation by Water in the United States (Washington, 1909) it is stated that there was in operation a total mileage of 1360 miles, including branches and feeders of State canals in New York, Ohio, Illinois, and Louisiana. With the exception of the improvement of the canals in the State of New York, the majority of these are antiquated and inadequate, and the original cost of \$156,983,538 is giving but little return to the citizens of the States concerned. This report refers to but 16 private canals aggregating 632 miles in length, as possessing more than local importance and representing a capital stock of \$13,326,539. The construction of practically all the canals in the United States has rendered impossible the use of mechanical transportation, and their limited dimensions have restricted the size of boats or barges that can be used. Consequently there is practically no data on which to base opinions as to the success of steam or electric towed barges of 1000 or 1500 tons capacity, such as are required by modern transportation conditions and such as have been proposed for the New York State Barge Canal.

Canadian Canals. The Canadian canal system is one of the most important in the world, and comprises the St. Lawrence and Lake Navigation, the Ottawa and Rideau Navigation, the Richelieu and Champlain Navigation, and the River Trent Navigation. Of these the St. Lawrence system is the most important, as it gives a 14-foot waterway from the head of Lake Superior to the Gulf of St. Lawrence. The canals of the St. Lawrence system are the following:

NAME OF CANAL	Length Miles	Number of locks	Lockage Feet	Dist. from prec. canal
St. Mary's	0.66	1	18.	.....
Welland	26.75 *	25	362.75	600 miles
Galops	7.625	3	15.5	226 "
Rapide Plat	4.	2	11.5	4.5 "
Farrans Point	0.75	1	4.	10.5 "
Cornwall	11.5	6	48.	5.
Soulanges	14.	4	82.5	32.75 "
Lachine	8.5	5	45.	15.25 "

* New and enlarged canal started in 1913.

Ship Canals. *Examples.*—In the last half of the nineteenth century, with the development of steam navigation and maritime trade, a demand arose for the construction of canals of large dimensions across isthmuses to shorten the route by sea between certain countries, to connect important internal manufacturing and commercial cities with the ocean, or to afford communication between bodies of water in the interior of a continent. Among the more notable examples of such ship canals are the Panama, Suez, Corinth, Manchester, St. Mary's, St. Petersburg and Kronstadt, Kiel, Amsterdam, and Cape Cod.

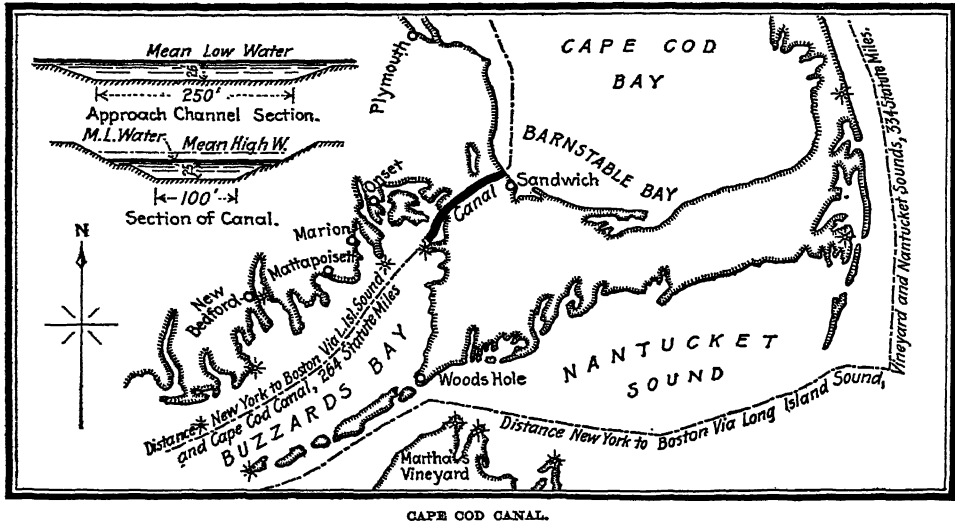
The Panama Canal (q.v.), completed in 1914, traverses the Isthmus of Panama from Colon on the Caribbean Sea to the Bay of Panama on the Pacific Ocean, and is about 49 miles in length. A portion of the waterway is formed by Gatun Lake, 85 feet above mean tidewater and reached by a flight of locks at Gatun 7 miles from Colon and at Pedro Miguel and Miraflores on the Pacific side. These locks have a usable width of 110 feet and a length of 1000 feet with a depth of 40 feet. *The Suez Canal* (q.v.) cuts through the Isthmus of Suez and connects the Mediterranean with the Red Sea. It is about 100 miles long, has a bottom width of 72 feet and a depth of 26 feet, and was built 1860–69. *The Manchester Canal* runs from the Mersey at Eastham, just above Liverpool, to Manchester, is 35.5 miles long, 26-feet deep, and has a minimum bottom width of 120 feet. It is built in four reaches connected by three sets of locks at Latchford, Islam, and Barton, the sizes of the locks of each set being 550 × 60 feet, 300 × 40 feet, and 100 × 20 feet. One of the notable structures of this canal, and the only one of its kind, is a swing aqueduct by which the Bridgewater Canal is carried over the Manchester Canal. This aqueduct opens exactly like a swing-span drawbridge to permit vessels with masts to pass through. *The Corinth Canal* is another of the transisthmian type, crossing the Isthmus of Corinth with a cut 4 miles long, 72 feet wide, and 26.5 feet deep. This canal was completed in 1893. It is stated that this canal was projected by Alexander the Great, determined upon by Julius Cæsar, and actually begun by Nero, though his work never progressed beyond a few hundred yards.

The Saint Mary's Canal, commonly known as

the Sault Ste. Marie Canal, connecting the waters of Lake Superior with those of the St. Mary's River and Lake Huron, around the St. Mary's Falls in Michigan, is but a few thousand feet long, and is chiefly remarkable for its enormous traffic and for having the largest lock in the world. There are now two canals, or canal systems, one on either side of the national boundary maintained by the respective governments. The Canadian Canal, built by the Dominion government in 1888 to 1895, is $1\frac{1}{2}$ miles in length, 150 feet wide, 22 feet deep, and has a lock 900 feet long, 60 feet wide, with a depth of 20 feet 3 inches at extreme low-water level. This depth gave it an advantage of about 8 inches over the Poe lock of the United States Canal built in 1896, and at the time of its construction the largest in the world. Accordingly, in 1907, the widening and deepening of the old American Canal above the locks was begun, and a project involving the construction of a new canal and lock, 1350 feet in length, 80 feet in width, and 24.5 feet in depth at extreme low water, was

Baltic to Brunsbüttel on the Elbe. It is 60 miles long, had a bottom width of 85 feet and a depth of water of 28 feet. The bottom width subsequently was increased to 140 feet and the surface to 330 feet, while the depth was made 36 feet, so that the largest naval warships could pass through, the locks at either end being enlarged to 1140 feet long by 148 feet wide and 46 feet deep. By this canal seagoing vessels save over 200 miles in going from the Baltic to the North Sea. The *Amsterdam Canal*, like the Manchester, was built to connect an inland city with the sea. The total length of this canal is 16.5 miles from Amsterdam on the Zuyder Zee to the North Sea, but as the route lay through the inlet called the Y and the Wyker Meer, only 3 miles had to be excavated. This canal is 88 feet 7 inches wide on the bottom and 23 feet deep.

Cape Cod Canal. An artificial channel excavated across Cape Cod, connecting Buzzard's Bay with Barnstable Bay at Sandwich, Mass. This ship canal, which was practically completed



CAPE COD CANAL.

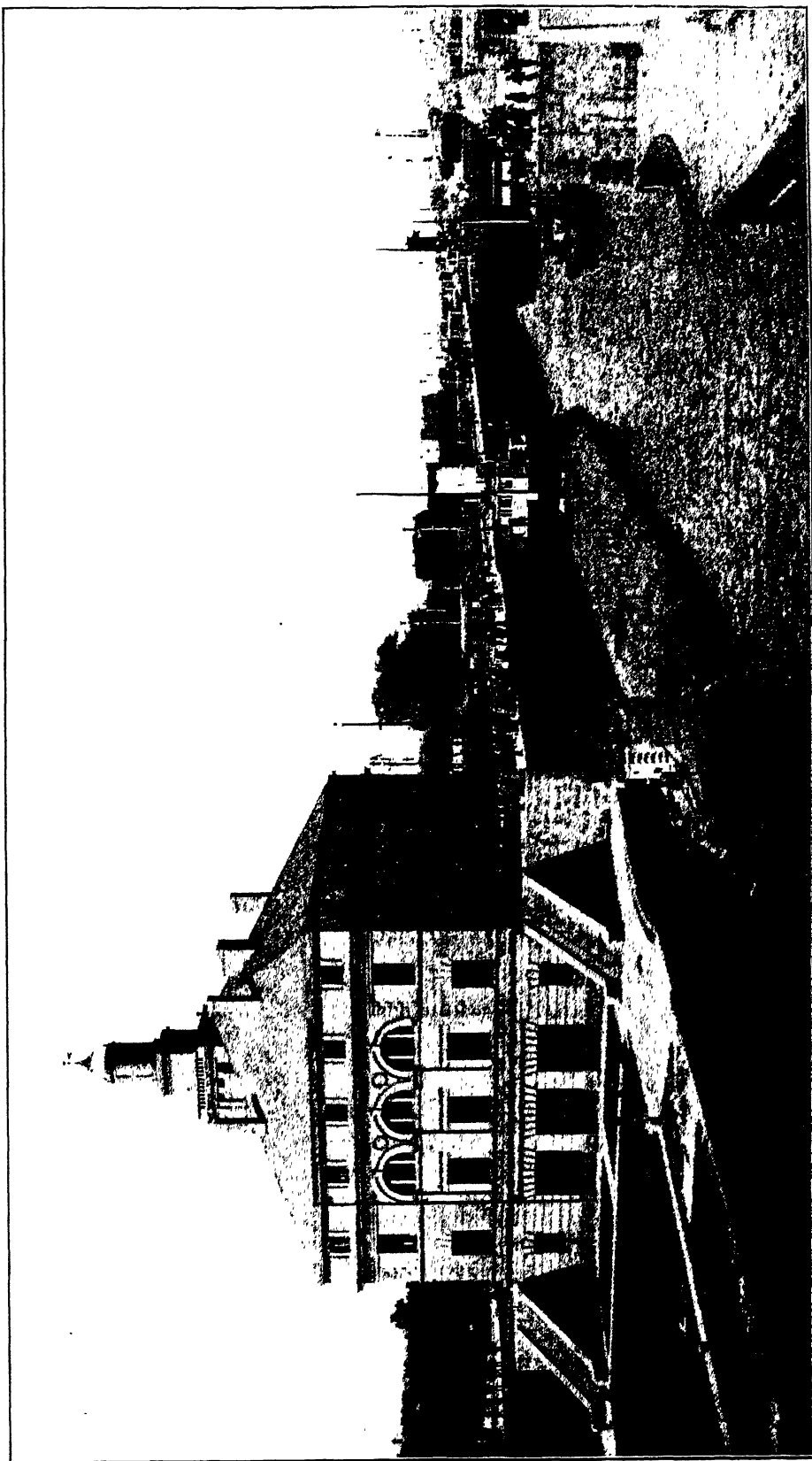
undertaken. This new, or Davis, lock was nearing completion in 1914, and a fourth lock of similar dimensions with a new canal was authorized by Congress, July 25, 1912. The tonnage passing through Sault Ste. Marie Canal is apt to run some $2\frac{1}{2}$ times greater than that passing through the Suez Canal, and in the year 1913 amounted to 79,718,344 short tons. The importance of this canal is shown by the fact that 70 per cent of the commerce of the Great Lakes, which is estimated at nearly 100,000,000 tons, passes through the canal and river. See SAINT MARY'S CANAL.

The Saint Petersburg and Kronstadt Canal was completed in 1884. Owing to the bar at the mouth of the Neva, ships were not able to reach St. Petersburg, and the canal from Kronstadt to the capital was built at a cost of \$7,200,000 to overcome this barrier. It is 18.75 miles long and 22 feet deep, with a bottom width of 275 feet, except near St. Petersburg, where it is only 207 feet. The channel was subsequently dredged to 28 feet in depth.

The North Sea and Baltic Canal, more commonly known as *The Kiel Canal* or *The Kaiser Wilhelm Canal*, runs from Holtenau on the

in 1914, saves shipping en route from Long Island Sound to Boston and other New England points, the distance through Vineyard Haven Sound, Nantucket Sound, and around Cape Cod, or a distance of about 70 miles. The canal is 25 feet in depth at mean low water and 100 feet wide at the bottom, the sides having a slope of 1 in 3 where the banks were of sand. In exposed soft places the banks were riprapped. There is an approach channel of 26-feet depth at mean low water, at least 200 feet wide at the bottom at either end. From shore to shore the length of canal is eight miles, but the entire channel excavated from 30-feet depth in either bay is 13 miles. The canal is practically straight with but a single turn of 7640-feet radius and the entrance at Barnstable Bay is protected by a breakwater 3000 feet in length. In the period from 1843 to 1903, 2131 vessels were wrecked in the region of Nantucket shoals, and of these 908 proved total losses, while about 700 lives were lost. The yearly tonnage passing through Vineyard Haven Sound previous to the construction of the canal was estimated at 25,000,000 tons, of which coal in barges amounted to about 9,000,000 tons. This means of transpor-

CANAL



WEITZEL LOCK.

POE LOCK.

SAINT MARY'S (Sault Sainte Marie) CANAL, Michigan. A "whaleback" steamer with tow is leaving the lock for lower lake ports.

tation is a leading source of coal supply for New England.

The project for a canal across the sandy isthmus between Barnstable Bay and Buzzard's Bay was agitated as early as 1697, and in 1776 General Washington caused inquiry to be made as to moving troops across this point so as to avoid the enemy and save the hazardous voyage around Cape Cod. In 1780 General Knox made estimates for the construction of a canal at this point and in 1791 surveys were made by Winthrop and Hill. Actual work was commenced by a chartered corporation which made an assignment in 1890. In 1909 the construction of the breakwater at the Barnstable Bay end of the canal was commenced, and from that time the work was vigorously prosecuted. The excavation was done by means of hydraulic dredges, two of which were the largest in the world and were capable of removing over 4000 cubic yards per day from the canal. The excavation was simple as it was entirely through sand, although a deposit of bowlders was encountered. The excavation was made at the rate of about 400,000 cubic yards per month, and before it was completed the granite breakwater, 3000 feet long, in Barnstable Bay was finished and a four-mile approach in Buzzard's Bay had been dredged. It was thought that later the canal might be increased in depth.

Haulage on Canals. The universal method of hauling boats on canals until very recent times has been animal power exerted through a towrope attachment to the boat. In China the hauling is done by men who walk along a towpath on the bank and pull the boat after them; in most other countries this work is done by horses and mules. Various attempts have been made to substitute steam power for hauling canal boats, and such power is considerably used, especially in Europe and on the large canals. In Europe a system of haulage has for some time been in successful operation in which a cable extends along the bottom of the canal, and traction is secured by means of a steam engine on the canal boat, which works a drum over which the cable is made to fall. By this system tugboats may be employed to haul several canal boats at a time. In Germany barges towed in trains have been found more economical than self-propelled barges, while, unless there is considerable traffic, steam haulage is cheaper than electricity. On the Teltow Canal boats are moved in trains of two by electric traction locomotives on the bank. In recent years numerous experiments have been made with electric power for haulage on canals, but it has not been adopted to any general extent, though it is believed to be the best form of traction. The remarks apply only to haulage on boat canals; the vessels using ship canals traverse them by their own power, except in passing through locks, where some mechanical means, such as the electric locomotives of the Panama Canal, or mechanical capstans or windlasses may be used.

Bibliography. For an account of the leading canals of the world, with their chief commercial and other features, consult: *United States Summary of Commerce and Finance*, December, 1901, May, 1902, and January, 1905; Countryman, "Canals and Other Inland Waters" in *Transportation by Water, 1906*; *Special Reports U. S. Bureau of the Census* (Washington, 1908); *Reports of the State Engineer and State Surveyor,*

State of New York (Albany); *Reports of Internal Waterway Commission* (Washington); *Reports of International Congress of Navigation*; *Reports Chief of Engineers U. S. Army*, and the files of the engineering press. Consult also Hulbert, *Great American Canals* (Cleveland, 1904). For descriptions of canals for other than transportation purposes, see DRAINAGE; IRRIGATION; WATER SUPPLY; ETC.

CANAL DOVER. A city in Tuscarawas Co., Ohio, 70 miles (direct) south of Cleveland, on the Tuscarawas River, the Ohio Canal and the Baltimore and Ohio and Pennsylvania railroads (Map: Ohio, G 4). The city contains the County Orphans' Home and the Union Hospital. There are coal, iron, clay, and shale deposits in the vicinity, and the city manufactures sheet iron, steel, tin, pig iron, flour, racing wagons and sulkies, sadirons, baby carriages, corrugated roofing, boiler plates, etc. Settled in 1807, Canal Dover was incorporated in 1865. The government, under a general law of 1902, is vested in a mayor, elected every two years, and a city council. The municipality owns and operates the water works and electric lighting plant. Pop., 1900, 5422; 1910, 6621.

CANAL DU MIDI, ká'nál' du mé'dé', or CANAL DU LANGUEDOC. A canal in the south of France, connecting the Mediterranean Sea and the Atlantic Ocean. It extends for 150 miles from Toulouse on the Garonne River to Cette on the Mediterranean. It is 60 feet wide, 6½ feet deep, has 114 locks, 50 aqueducts, and reaches a maximum altitude of 600 feet. It is navigable for vessels of 100 tons. It was completed in 1681 at a cost of \$3,500,000.

CANALE, ká-ná'la, MICHELE GIUSEPPE (1808-90). An Italian historian. He was born in Genoa, and through Cavour's influence secured the professorship of history and geography at the Polytechnic Institute of his native city. In 1858 he founded the *Società Ligure di Storia Patria*, for the study of national history. He wrote historical dramas and romances, but his important works were the *Storia dei Genovesi* (1844-54) and *Storia della repubblica di Genova* (1858-74).

CANALEJAS Y MÉNDEZ, ká'ná-lá'nás ē mán'dás, José (1854-1912). A distinguished Spanish statesman. He was born July 31, 1854, at Ferrol, his parents early removing to Madrid. As a child he was precocious, when 10 years old translating and publishing a small French work, and when only 18 receiving his doctor's degree from the University of Madrid. He then began to take part in political agitations, showing himself a strong Radical, and in 1880 aiding in the publication of *El Demócrata*. The following year he represented Soria in the Cortes, becoming prominent from the first, despite his connection with the party of the Opposition. Later he was deputy for the District of Agreda; and in the Cortes of 1887, while representing Algeciras, he was made chairman of the military reform commission. During the existence of the ephemeral republic (1873-74) he had served as subsecretary to the President of the Council of Ministers, but this did not seem to affect his subsequent prominence, although it made him unwelcome at court. Canalejas was third vice president of the Cortes and was occupied also with his *Derecho parlamentario comparado* when called upon in 1888 to serve as Minister of Agriculture; in December of the same year he was transferred to the Ministry of

Justice, and this office he held until 1890. In 1894-95 he was Minister of Finance. It was not, however, until 1900, when he urged in the Cortes that war must be declared on clericalism, that he became a really important national figure. Immediately the Socialists and Republicans rallied to his support, and, after accepting the portfolio of agriculture in the cabinet of Sagasta (1902), he added to his popularity by his reforms for the working classes. In 1904, in an oration memorable in Spain, he defended the right of parliamentary immunity, which had been attacked by the Conservatives.

King Alphonso, who had shown himself hostile to Canalejas, became his warm friend after hearing an address made by the Radical leader at the Academy of Jurisprudence. Close on the gaining of the King's favor came the election of Canalejas to the presidency of the Cortes in 1906, when the Liberals were in power, and in 1910 King Alphonso surprised the nation by asking this advanced Radical to take the premiership. Although Canalejas set before himself a difficult programme in undertaking to accomplish the separation of church and state, in the end he completely controlled the situation. In this connection one of his most important measures was that known as the "Padlock Law," which provided for the temporary refusal to authorize the establishment of new religious orders. (See SPAIN, *History*.) He resigned on April 1, 1911, because of opposition to the decision in the case of Ferrer, the anarchist philosopher, but the King immediately directed him to form a new ministry. The troubles in Morocco in 1911, the antimilitarism agitation, strikes and disorders in Spain, and the opposition that the Prime Minister aroused among the extreme Radicals, somewhat dimmed his popularity, but seemed not to impair his general control of affairs. He was shot and killed by an anarchist in the streets of Madrid, Nov. 12, 1912.

Canalejas was without doubt one of the strongest figures in Spanish political history in modern times. Although an inborn Radical, he was practical in his reforms and moderate in his methods. His economic undertakings, including the building of railroads and the development of industries, gave promise of lifting Spain to the general level of European nations. Not alone through governmental positions were his great merits recognized. Elected (1900) a member of the Academy of Moral and Political Sciences, he became also, in 1904, a member of Spain's oldest and proudest academy, the Royal Spanish Academy, and, in 1907, dean of the Colegio de Abogados of Madrid and president of the Royal Academy of Jurisprudence. For complete texts of the discourses for and against his programme in the Cortes of 1910 consult *Canalejas gobernante: Discursos parlamentarios, Cortes de 1910 (Valencia) and La Ley llamada del "Candado," y la oposición católica en las Cortes (Madrid)*. Among the publications of Canalejas himself is *El partido liberal* (1912). Consult Luis Antón del Olmet and Arturo García Caraffa in *Los grandes Españoles*, vol. iv (Madrid, 1913).

CANALETTO, kă'nă-lăt'tô. The name applied to two Venetian architectural painters.—**ANTONIO CANALETTO**, properly **DA CANAL** or **CANALE** (1697-1768), was born at Venice and, after studying with his father, Bernardo, and with Carlevaris, acquired in Rome a high reputation

as a painter of antique ruins. Returning to Venice, he devoted himself to the Venetian scenes for which he has become justly famous. Correct in line and warm and true in color, he is the most important painter of the old Venetian school except Tiepolo, who is said to have often painted the figures for his landscapes. In 1746 he went to England and painted many charming English landscapes, together with views of Eton College and of Whitehall. His numerous works are found in all the principal European collections, and he is well represented in the Metropolitan Museum, New York, the Boston Museum, and the Art Institute of Chicago. His importance as a teacher is attested by such pupils as Francesco Guardi and his nephew, **BERNARDO BELOTTO** (1720-80), called Canaletto. He also was born in Venice and perfected himself in Rome. After laboring for some time for the Elector Charles Albert at Munich, he was appointed court painter at Dresden in 1747. In 1758 he went to Vienna, and about 1770, as painter to the King, to Warsaw, where he died. His paintings, mostly views in cities in which he lived, are very numerous, especially at Dresden and Vienna. While his art is similar, it is inferior, to Antonio's. Both are excellent etchers of Venetian subjects. Consult Meyer, *Die beiden Canaletti* (Dresden, 1878) and *Les deux Canaletti* (Paris, 1906).

CANAL RING. See **NEW YORK, History**; **TILDEN, SAMUEL J.**

CANANDAIGUA, kăn'an-dă'gwă. A city and the county seat of Ontario Co., N. Y., at the north end of Canandaigua Lake, 29 miles southeast of Rochester, on the Pennsylvania and New York Central railroads and the Canandaigua Lake Steamboat Line (Map: New York, C 5). The city, a popular resort, is celebrated for picturesque scenery and fine private residences, and contains among the more noteworthy features a fine courthouse, an historical museum, a public library, an orphan asylum, public and private hospitals, private institutions for the aged and for the insane, and Canandaigua Academy. Its manufactures include enameled ware, tinware, and malt liquors. Settled about 1789 and incorporated as a village in 1815, Canandaigua became a city in 1913, and is governed by a mayor and a board of aldermen. The city owns its water works and sewage system. The abduction of William Morgan from the county jail in Canandaigua in 1826 caused an excitement that extended throughout the State and was the subject of heated political controversy. Pop., 1890, 5368; 1900, 6151; 1910, 7217.

CANANDAIGUA LAKE. A lake in Ontario County and forming part of the western border of Yates Co., N. Y. (Map: New York, C 3). It lies nearly north and south, is 15 miles long by nearly 2 miles wide, 668 feet above the tide, and 421 feet above Lake Ontario, into which it discharges its waters through the Canandaigua outlet, the Clyde, Seneca, and Oswego rivers. It receives its tributary waters mainly at the south end and has its outlet at the north end. It is surrounded by high banks and furnishes charming scenery, and its steamboats are extensively patronized by pleasure seekers.

CANANORE, kăn'a-nôr'. See **KANANUB**.

CANA OF GALILEE. A town mentioned several times in the Gospel of John. Here Jesus performed his first miracle, the changing of

water into wine (John ii. 1-11). When there again later in his ministry he healed with his word the nobleman's son, who was sick in Capernaum (John iv. 46-53). It was the home of Nathanael, one of his early disciples (John xxi. 2). The site is not certainly known, but as Jesus' mother and apparently the rest of the family (John ii. 12) were present at the wedding, it is not likely to have been far distant from Nazareth, and as they are said to have gone "down" from there to Capernaum, it was most probably situated among the hills. Some maintain that the conditions are best met by 'Ain Kānā, about 8 miles north of Nazareth, on the ridge back of the Plain of Aschis, while others hold to Kānat El-Jellī, north of Sephoris. The traditional site is Keḡr Kenna, 4 miles northeast of Nazareth, on the road to Tiberias. Philological reasons would be in favor of the first-named site.

CANARD, kā-nārd' (*Fr. pron. kā-nār'*, a hoax, cheat, literally a duck). An absurd and sensational story. The origin of this application of the word *canard* (duck) is uncertain. Some derive it from the old phrase *vendre un canard à moitié*, literally 'one who half-sells a duck,' that is, pretends to sell a duck, but does not complete the transaction; while others attribute its origin to the following marvelous tale circulated by Cornelissen in order to try the gullibility of the public: Having at one time twenty ducks in his possession, he killed them one by one and gave their bodies to the diminishing number of survivors, who successively devoured them, until one out of the twenty was all that remained, and this one had actually gobbled up his nineteen comrades. A corresponding expression in the United States is the term *roorback*, a fictitious narrative published to gain some political advantage. It originated in 1844 from a story of some notoriety purporting to be an extract from the *Travels of Baron Roorbach*.

CANARESE, kān'ā-rēz'. See **KANARESE**.

CAÑARI, kā-nyā'rē. One of several ancient tribes around the Gulf of Guayaquil, Ecuador, conquered and incorporated by the Incas, about 1450. The Cañaris occupied the inter-Andine region now included in the provinces of Cañar and Azuay, and their language, surviving only in place names, formed a distinct stock. They were skillful metal workers, their technique differing from that of the Quichua. Copper axes, curiously ornamented, are found in their tombs, and, according to Suarez, sometimes as much as 500 pounds weight in a single deposit. Some of the most beautiful gold ornaments of the Andean region have also been found in their territory. Mountain, lake, and serpent worship existed among them. They had also many festivals, dances, etc. Consult: F. G. Suarez, *Estudio historico sobre los Cañaris Antiguos* (Quito, 1878), and other writings; Saville, *Antiquities of Manabí, Ecuador* (New York, 1907-10); and R. Verneau and P. Rivet, *Ethnographie ancienne de l'Equateur* (Paris, 1912), especially pp. 29-36.

CANARIE, kā'nā'rē'. A dance, now obsolete, supposed to have come from the Canary Islands. It was a favorite dance in France in the time of Louis XIV, and it is mentioned by Shakespeare. The canarie was a species of gigue resembling the *loure*, only quicker in tempo, requiring two dancers and involving very extravagant gestures.

CANARIUM (Neo-Lat., from East Indian

canari, from *Kanara*, or *Canara*, a district of southwestern India). A genus of trees of the family Burseraceae, the species of which are natives of the southeastern parts of Asia, the Malayan archipelago, Australia, etc. The fruit is a drupe. The kernel of the fruit of *Canarium commune* is eaten both raw and roasted, and in Amboyna bread is made of it. An oil is expressed from it, which is used both for table purposes and for lamps. The tree is about 50 feet high and has a bark which yields a heavy oil that has the same properties as balsam copaiva and may be substituted for it. *Canarium sylvestre* also produces eatable kernels. The timber of this species is hard, tough, and close-grained, and is used for furniture. *Canarium commune* is supposed to be one of the trees which yield the resin called elemi, and *Canarium strictum* is a large tree in Bombay and Madras, where it grows at elevations up to 4500 feet. The foliage is very brilliant and attractive. From the trunk a gum exudes, the black dammar of commerce. It solidifies upon the tree into black lumps, but is amber colored by transmitted light. *Canarium australium* furnishes a timber valuable in finishing houses.

CANARY (named after the Canary Islands). A small finch or serin (*Serinus canarius canarius*), a native of the Canary Islands, Madeira, and the Cape Verde, but introduced into Europe as a cage bird in the latter part of the fifteenth or early in the sixteenth century, and now found as a captive in all parts of the world where Europeans have gone. So popular has the canary become as a cage bird, on account of its power of song and its gentle manners, that the breeding of canaries for the market is not only a popular avocation in some places, but even an important industry. In the wild state the plumage is dull greenish, streaked with darker shades, like a siskin (q.v.), and the yellow, orange, or red shades of the domesticated birds are entirely the result of man's artificial selection. The size of the canary, as well as its color, has been profoundly modified by domestication, and some varieties are half as large again as the wild bird, which is rather more than 5 inches in length. The musical powers of the bird have also been considerably modified and there is much variety in the different breeds in this particular, but it is doubtful whether in power or clearness the domestic birds are the equal of those which are wild. In their native haunts canaries frequent the vicinity of houses, build their nests of moss, hair, grass, feathers, etc., in bushes or trees, and raise two or more broods in the season. The eggs are four or five in a set, and are pale blue, generally unspotted. The birds feed chiefly upon seeds, especially of certain grasses, but they also eat soft green leaves, buds, and occasionally insects.

The breeding and training of canaries is a subject of much interest and no little importance. It has been carried on most extensively in northern England, Scotland, Belgium, and especially in the Harz Mountains in Germany. The various breeds of canaries take their names in part from the locality where bred, and in part from some characteristic of the breed which is specially notable. There are a large number of varieties, of which the following are the most important. To begin with the British breeds, the Norwich canary is famous for the beauty of its plumage, but not for its great powers of song. It is an inferior singer com-

pared to other breeds, especially some of the Harz Mountain birds. The Norwich canary is often crested, a pleasing addition to its appearance. The Manchester canaries are also notable, particularly the Manchester copy, which is the giant of canaries, sometimes reaching a length of 8 inches. They are not, however, remarkable songsters. Among the more curious breeds are the Yorkshire Don and Scotch Fancy, which are very slender, with long neck, trunk, and tail, gracefully curved, so that in extreme examples the bird is almost a half-circle. Among the handsomest breeds are the gold and silver "spangled" canaries, which, as their names imply, are not uniformly colored, but have a comparatively dull ground color, spangled with very bright or very pale feathers. These breeds are more valuable as ornaments than as musicians. The Belgian canaries are also bred especially for appearance, and some of them are almost monstrosities. The most notable of these is the variety known as "humped-backs," which have a small head, very short neck, and broad shoulders, a combination that gives a very odd appearance. They are usually yellow, but the color is a secondary matter. The Harz Mountain canaries are the most famous of all, and are especially noted for their powers of song. The color is regarded as of much less importance, and consequently they vary much from bright green to clear yellow. The best of all singers are the Saint Andreasberg canaries, and the choicest of these command a large price. Individual birds, with exceptional ability as singers, are used as instructors for young birds, and are known as "campaninis." There are two other breeds of canaries not confined to any special locality, but which take their names from their color. The most interesting of these are the natural *cinnamons*, which are deep brownish yellow or reddish, and are often very beautiful. The others are known as *cayennes*, and are reddish, a color produced by judicious feeding of red pepper to the growing birds. They are sometimes nearly scarlet, and often handsome birds, but breeders of cinnamons regard them as an abomination.

The price of a canary depends upon its approach to the ideal bird of its breed, but the females are usually the cheaper. From \$1 to \$75 is the range of value for the great majority of canaries, but exceptional individuals may bring as high as \$150. The highest prices are paid for the Saint Andreasberg campaninis. Canaries are often crossed, by fanciers, with other finches, and the hybrids thus produced are sometimes valuable as cage birds, either for appearance or peculiar qualities of song.

These hybrids are called "mules," and are usually the result of mating other cock birds with hen canaries, on account of the difficulty of persuading female linnets, goldfinches, etc., to sit on their eggs in captivity.

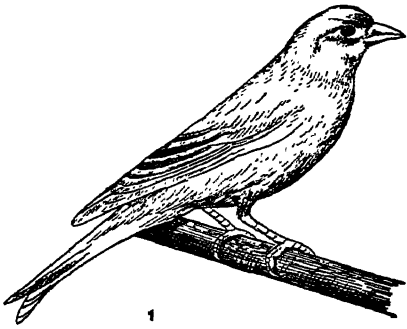
Canaries are the easiest of cage birds to care for, as almost the only essentials are cleanliness, food, and water. The cage and especially the food and water vessels should be kept scrupulously clean. A bath should be provided at least once a day, the water being made tepid in very cold weather, and occasional freedom from the cage in a closed room is a real benefit to the bird. Care should be taken not to expose the bird to cold drafts, hence it is usually unwise to hang the cage near windows during wintry weather. The principal articles of food should be canary seed and rape, but green leaves, such

as chickweed, are necessary to maintain perfect health. Hemp may be given in less quantities. Sugar is also greatly enjoyed by canaries, and is a proper food in small quantities; but acids, such as fresh apple, should be avoided. Lime is essential to the bird's welfare, and is best provided in the form of cuttlefish bone. The nails are apt to grow so long, in canaries kept in small cages, that they should be cut occasionally to prevent them from becoming troublesome to the bird. Many canaries and other birds are made uncomfortable or actually made to suffer from improper sized perches. Those usually furnished with brass cages, which are large in the centre and dwindle towards each end, are ill adapted for such small birds. The perches should be no thicker than a thin lead pencil, so that the bird's toes may meet around them. For further information in reference to the care of canaries and their breeding, consult: Wallace, *The Canary Book* (London, 1893); Holden, *Canaries and Cage-Birds* (New York, 1883); Belts, *The Pleasurable Art of Breeding Pet Canaries* (London, 1897); Blakston, Swaysland, and Miener, *The Book of Canaries and Cage Birds* (London); Robson, *Canaries, Hybrids and British Birds in Cage and Aviary* (London, 1912); *Cage-Birds*, a weekly paper published in London. See CAGE BIRDS; and Plate of CANARY BIRDS.

CANARY GRASS (*Phalaris canariensis*).

An annual grass of which the seed is much used, under the name "canary seed," as food for cage birds, and which is, on that account, cultivated to some extent in the south of Europe and in certain districts of Germany and England. It is a native of the Canary Islands, the south of Europe, north of Africa, and Asia. It has been introduced and has become naturalized in England and various parts of the United States. It attains a height of 2 or 3 feet, and has a crowded, egg-shaped, spikelike panicle, from an inch to almost 2 inches long. A fine flour is prepared from canary seed, which is employed as glue or sizing in fine cotton weaving and for the finishing of silken stuffs. The groats and flour of this small kind of grain are also used in the Canary Islands, in Barbary, and in Italy as food, the flour being made into bread, which is very nutritious and pleasant. Other closely allied species of *Phalaris* produce a similar grain, but are inferior in productiveness and quality. Reed canary grass (*Phalaris arundinacea*) is very common on the banks of lakes and rivers and in other wet places in Great Britain, throughout southern and central Europe, and in the United States. It differs very much in appearance from canary grass, having a large, spreading panicle, generally of a reddish color, and the glumes are winged at the keel. It is a somewhat reedlike grass, 4 to 6 feet high, with creeping roots, which help to secure river banks, and yields a great bulk of hay, but has been very generally despised as a coarse grass. However, it is said to be very nutritious, and is readily eaten by both horses and cattle when cut early. A variety with curiously white-striped leaves is well known in gardens as ribbon grass. Southern canary grass (*Phalaris caroliniana*) and its variety, *angusta*, sometimes considered as a distinct species, range from South Carolina to Florida and westward through Texas to California and Oregon. The variety is called Apache timothy, from the resemblance the head bears to that of

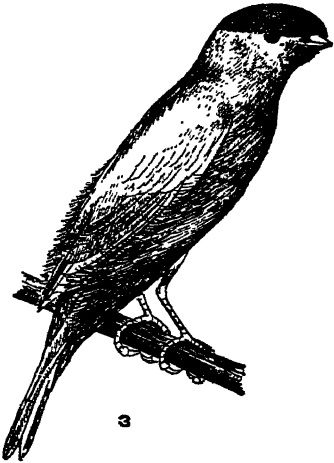
CANARY BIRDS



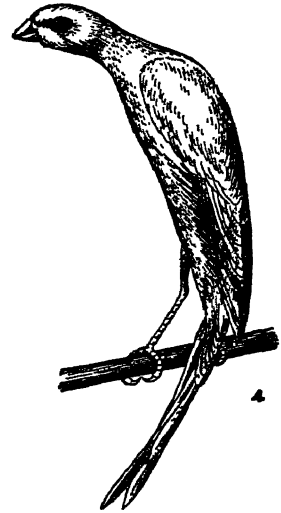
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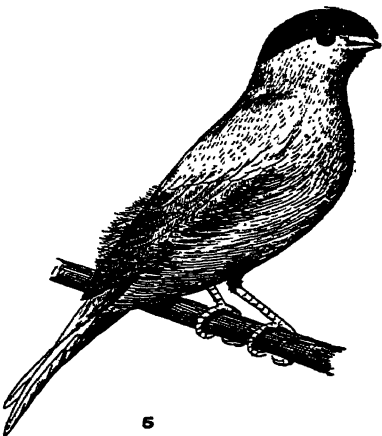
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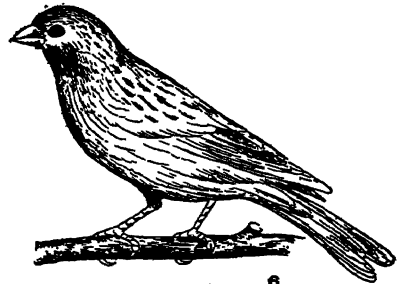
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1. GOLDFINCH MULE (Canary and goldfinch).
2. YORKSHIRE DON.
3. MANCHESTER COPPY.

4. SCOTCH FANCY CANARY.
5. NORWICH CRESTED CANARY.
6. WILD CANARY.

timothy. It is valued for forage on account of its remaining green throughout most of the winter. For illustration, see Plate of *CAMELLIA*, ETC.

CANARY ISLANDS, or **CANARIES** (Lat. *Canaria*, from *canis*, dog, perhaps because of the shape of the largest island). A group of islands in the Atlantic, about 60 miles off the northwest coast of Africa, constituting a province of Spain (Map: Africa, C 2). They extend from about lat. 27° 40' to 29° 25' N., and from long. 13° 25' to 18° 16' W., forming a land area of 2808 square miles. The group consists of the seven large inhabited islands, Tenerife (782 square miles), Gran Canaria (531 square miles), Palma (280 square miles), Gomera (144 square miles), Ferro or Hierro (107 square miles, the smallest of the large islands), Fuerteventura (665 square miles), and Lanzarote (326 square miles), and six islets. The entire group is of volcanic origin, and there are extinct volcanoes on all the islands. The volcanoes of Pico de Teyde on Tenerife and the Mountain of Fire on Lanzarote are but slumbering. The former, the loftiest mountain of the Canaries, often called the Peak of Tenerife, rises to a height of 12,190 feet.

The climate is generally mild and healthful. The average temperature for the year is about 65°, while the maximum and minimum are about 80° and 52° respectively. Precipitation is very scant and occurs mainly in winter; droughts are frequent. The hot east and southeast winds blowing from Africa dry up the vegetation. There are several zones of vegetation depending on the altitude, but in general the west slopes furnish a more abundant vegetation than those on the east. The vegetation of the lowest zone, extending up to 1200 and 1300 feet, is more or less African, and includes the date palm, sugar cane, the dragon's-blood tree, etc. In the second zone, between 1200 and 2800 feet, the flora resembles that of southern Europe and comprises the vine, the olive, the orange, and several kinds of European grain. In the third zone the vegetation is confined mostly to trees and includes the *Pinus canariensis*, evergreens, a few other conifers, and retama (*Cytisus rubigenus*), a fragrant broom. The native fauna offers little variety, and most of the animals have been imported either from Europe or Africa. The two easternmost islands, Fuerteventura and Lanzarote, possess a richer vegetation and are better wooded than the others.

The chief agricultural products are fruits (especially bananas), onions, and potatoes, which are exported to the West Indies. The production of wine, formerly of first importance, declined on account of disease in the vines in 1853, giving place to the cochineal industry, which in turn declined in favor of sugar-cane cultivation. Tobacco is grown. Land is high in value and is held mostly in large estates; the peasants are generally very poor and emigrate in considerable numbers to Cuba and to the other West Indian islands. The manufacturing industries are of little account and are confined chiefly to the production of some silk and cotton fabrics and coarse linen. The fisheries are important. Trade is largely with Great Britain and Spain. Inter-insular communication is maintained by means of sailing vessels, and communication with Europe is effected by mail steamers. The group is a Spanish province, and for administrative purposes is divided into seven districts. There is a Spanish garrison and a native militia. The

towns of Santa Cruz de Tenerife (the capital) and Las Palmas are fortified. The de facto population of the province was in 1910 (census of December 31) 444,016. The island of Gran Canaria had 162,601; island of Palma, 45,782; island of Tenerife, 180,327; Santa Cruz de Tenerife (commune), 63,004; Las Palmas (commune), 62,886.

The Canaries are regarded as the *Fortunate Insulæ* of the ancients and are supposed to have been known to the Phœnicians and the Carthaginians, judging from the description by Juba II, King of Mauretania. Before their annexation to Spain they were inhabited by the Guanches, a Berber tribe, now completely amalgamated with the Spanish settlers. Their discovery by Europeans in modern times dates from the fourteenth century, when a vessel was accidentally driven on the islands. In 1344 they were granted by the Pope to Luis de la Cerda, who, however, did not take possession of them. They were subsequently granted by Henry III of Castile to Robert of Bracamonte, and it was only in the beginning of the fifteenth century that an attempt was made to take possession of them. In 1402-05 Jean de Béthencourt, a French adventurer, to whom Robert of Bracamonte had transferred his title, conquered several of the islands, and by the end of the century the entire group was in the possession of Spain, Tenerife, the largest, having been taken in 1496. Consult Brown, *Madeira and the Canary Islands* (London, 1894).

CANARY SEED. See CANARY GRASS.

CANARY WINE. A wine which is also known as Tenerife, from one of the Canary Islands bearing that name, produced in these islands, and resembling Madeira. The name is applied properly only to the Bidogne wine, and must be distinguished from the Malvoisie of the Canaries, made from the Malvasia sweet grape. It increases in mildness with age, and becomes so much like Madeira that it is often sold for it.

CANASTOTA, kán'a-stō'tá. A village in Madison Co., N. Y., 21 miles east of Syracuse, on the New York Central, the West Shore, and the Lehigh Valley railroads, and on the Erie Canal (Map: New York, E 4). It has a Carnegie library, a hospital, and a soldiers' monument. The principal manufactures are agricultural implements, canned goods, pickles, condensed milk, furniture, gasoline engines, cut glass, dumping wagons, and mutescopes. Canastota was settled about 1806 and was first incorporated in 1835. The government is administered by a president, elected annually, and board of trustees. Seneca turnpike, built in 1790 and now a State road, runs along the southern boundary of Canastota. Pop., 1900, 3030; 1910, 3247.

CANAVERAL, CAPE. See CAPE CANAVERAL.

CANBERRA. See AUSTRALIAN FEDERATION.

CANBY, EDWARD RICHARD SPRIGG (1819-73). An American soldier. He was born in Kentucky, graduated at West Point in 1837, and was second lieutenant in the Seminole War from 1839 to 1842, and captain in the Mexican War in 1846-47, being brevetted major and lieutenant colonel for gallant conduct at Contreras, Churubusco, and Belen Gate. He then served as assistant adjutant general of the Pacific Division from 1849 to 1851, and in the adjutant general's office in 1851-55; participated in the Utah expedition of 1857-60, and commanded the Navajo expedition of 1860-61. During the Civil War he commanded the De-

partment of New Mexico from June, 1861, to September, 1862, successfully defending his territory from the attacks of the Confederate general, Henry Hopkins Sibley; was raised to the rank of brigadier general of volunteers in March, 1862; was in command of the Draft Rendezvous at Pittsburgh from November, 1862, to January, 1863; commanded the city and harbor of New York at the time of the Draft Riots (q.v.) in 1863; became a major general of volunteers in May, 1864, and commanded the military division of West Mississippi from May, 1864, to June, 1865, directing the Mobile campaign of March-April, 1865. In May, 1865, he received the surrender of the Confederate forces under Generals R. Taylor and E. K. Smith. At the close of the war he was brevetted brigadier general in the regular army for "gallant and meritorious services at the battle of Valverde, N. M." and major general for "gallant and meritorious services in the capture of Fort Blakely and Mobile, Ala." In July, 1866, he was promoted to the regular rank of brigadier general. In 1868 he was military governor of South Carolina. Afterward he commanded various military divisions and departments, and on April 11, 1873, while commanding the Division of the Pacific, was treacherously killed by the Modoc Indians while holding a conference with them near Van Bremmer's Ranch, Siskiyou Co., Cal.

CANBY, HENRY SEIDEL (1878-). An American college professor, born at Wilmington, Del. He was educated at Yale, where he became assistant in English in 1900, instructor in 1903, and assistant professor in 1908. He was lecturer in English at Dartmouth College in the summers of 1910 and 1911. His publications include: *The Short Story* (1902; rev. ed., 1913); *The Book of the Short Story* (1903); *The Short Story in English* (1909); *English Composition in Theory and Practice* (1909); *Selections from Robert Louis Stevenson* (1911); *Elements of Composition for Secondary Schools*, with J. B. Opdycke (1913); *Study of the Short Story* (1913).

CANBY, WILLIAM MARRIOTT (1831-1904). An American botanist, born in Philadelphia and educated mainly in private schools. Although in business, he devoted much time to the study of botany and described many new species of plants. He made large collections in the United States and Canada and was one of the botanists of the Northern Pacific Transcontinental Survey. His activity in botanical research has included the collection, through purchase, exchange, and gift, of a fine herbarium of more than 30,000 species of plants, now the property of the College of Pharmacy in New York City, and a smaller collection made for the Society of Natural History of Delaware.

CANCALE, kân'kal'. The capital of a canton in the Department of Ille-et-Vilaine, France, situated on a height overlooking the Bay of Mont Saint-Michel, 10 miles east of Saint-Malo (Map: France, N., D 4). It is a favorite seaside resort and a busy fishing port. Oyster culture is an important industry. It also engages in ship-building. Its harbor is inclosed by a small island, the Rocher de Cancale. Pop. of commune, 1901, 6549; 1911, 7627.

CAN'CAN (Fr., origin obscure; OF. *caqueshan*, tumultuous assembly, noise, quarrel. Romance scholars derive it from Lat. *quamquam*, *quanquam*, the pronunciation of which seems to have aroused considerable dispute among medi-

eval schoolmen, although the word may be purely onomatopoeic). A wild dance, or rather a series of violent choreographic movements, originated by the demimonde of Paris. It has some resemblance to the Bacchic or Dionysian dances of ancient Greece.

CANCAO, kân'kou', KANG-KAO, or HATTEN. A seaport of Cambodia, situated on the Gulf of Siam at the mouth of the river Cancao, on the frontier between Cambodia and Cochin China. The harbor is shallow, and the trade, once considerable, is now in a state of decline.

CAN'CELING (Lat. *cancelli*, latticework). The extinguishment of the rights or obligations created by a written instrument by obliterating or destroying the instrument itself. Originally the efficacy of the act depended on a strict compliance with the prescribed form of drawing transverse lines over the face of the document; but at the present time any mark or writing—as the word "canceled" indorsed on the back of the instrument—clearly showing the intention of the parties is equally valid. In general, the destruction, obliteration, or marking of an instrument creating property rights, whether accidentally or with the intention of canceling it, will not have the legal effect of extinguishing the rights or obligations created by it. Thus, the destruction of a deed by which real property has been conveyed will not operate to divest the title of the grantee and revert it in the grantor. The title, having passed by the deed, can be restored to the former owner only by another deed. So the tearing or obliterating of a written lease by the parties thereto will not have the effect of terminating the subsisting relation of landlord and tenant, as this can be effected only by a surrender made in writing or otherwise, as prescribed by law. The only exception to this rule is when the cancellation of an instrument—as a deed or letters patent—is ordered by a court for fraud or mistake, or because the instrument—a mortgage, for example—has answered its purpose and is entitled to be discharged. The case of a will, which may be canceled by the maker at his pleasure, is not a real exception to the rule, as a will does not go into effect and create property rights until the death of the testator. See **LETTERS PATENT; FRAUD; MISTAKE; WILL**.

Instruments creating mere contract rights, whether under seal or not—as written agreements for services or for the sale of goods, notes, and bills of exchange, and the like—may, on the other hand, usually be canceled by common consent of the parties thereto. Even where such contracts are required by law to be in writing, they are capable of being revoked by parol; and the cancellation of the instrument operates as a revocation or rescission of the contract, if made with that intention. Bonds were, and, to a certain extent, still are, instruments of a peculiar nature and are considered as comprehending within themselves all of the rights and obligations described in them. Even the accidental loss or destruction of such an instrument rendered it unenforceable at common law. While this is no longer true either in England or in the United States, a bond may always be extinguished by cancellation. See **CONTRACT; BOND; DEED**; and compare **ALTERATION** and **SPOILIATION**.

CAN'CELLA'RIOUS. See **CHANCELLOR**.

CAN'CELLATION (Lat. *cancellare*, to make like lattice; to strike out lattice-wise (X), to

cross out, cancel). The process of rejecting a common factor from both dividend and divisor, or a common term from both members of an equation. In reducing fractions any factor common to both numerator and denominator is rejected by cancellation; e.g.,

$$\frac{6}{8} = \frac{\cancel{2} \cdot 3}{\cancel{2} \cdot 4} = \frac{3}{4}.$$

Algebraic expressions are often simplified on the same principle; e.g.,

$$\frac{a^2 - b^2}{m + n} \cdot \frac{m^2 - n^2}{a - b} = \frac{(a - b)(a + b + b^2)}{m + n} \times \frac{(m + n)(m - n)}{a - b} = (a^2 + ab + b^2)(m - n).$$

The plan, formerly followed in textbooks, of treating cancellation as an independent chapter of elementary arithmetic has in recent years been discarded.

CANCELLERIA, kán-ch'á'lá-rě'a, PALAZZO DELLA. A Renaissance palace in Rome, once ascribed to Bramante; this ascription is now abandoned, since Bramante did not come to Rome till 1499. It was built in 1489 for Cardinal Riario, and is connected with the church of San Lorenzo in Damaso, built on the site of the basilica of Damasus I. The façade is of travertine blocks, taken from the Colosseum. The chief feature of the palace is the graceful court with a double row of red Egyptian granite pillars, removed by Damasus (about 370) from Pompey's Theatre to his basilica and thence to the palace.

CANCELLI. See CHANCEL; CHANCELLOR.

CANCER. See TUMOR.

CANCER (Lat., crab). The fourth of the 12 signs of the zodiac (q.v.), running from 90° to 120° on the ecliptic (q.v.). It is denoted by the sign ♋. The constellation Cancer contains the interesting cloudlike cluster called Præsepe, or the Manger, which lies between two stars of the fourth magnitude, known to the ancients as Aselli, or the Asses. The disappearance of the cluster was supposed to presage the occurrence of rain. Another interesting object in this constellation is the triple, possibly quadruple, star system, ζ Cancri, consisting of two close stars of the fifth and sixth magnitudes, which revolve about each other in a period of 60 years, and a third component which has a retrograde motion of unknown, but much longer, period. The motion of the latter is subject to a periodic variation, and it has been suggested that this component is the satellite of a massive dark body about which it revolves in 17.5 years and about which the other pair are also in revolution.

CANCER, TROPIC OF. See TROPIC.

CANCER-ROOT, or BEECHDROPS (*Epifagus virginiana*). A parasitic plant of the family Orobanchaceæ. It is a native of North America, growing almost exclusively on the roots of beech trees. Like all the other plants of its order, it has a curious appearance, having scales instead of leaves. Its stem is branching and produces distant alternate white flowers, streaked with purple. The whole plant is powerfully astringent, and the root is brownish, spongy, very bitter, and nauseous in taste. This plant at one time had quite a reputation as a cure for cancer, and, in conjunction with white oxide of arsenic, is believed to have formed a medicine once famous in the United States under the name of "Martin's Cancer Powder." The

same name is also given to *Conopholis*, another genus of the same family. Another American plant, the Indian pipe (*Monotropa uniflora*), is sometimes also called cancer-root and is used in the same way; and an infusion of the common broom rape (*Orobancha major*), a native of Great Britain and of the south of Europe, parasitic on the roots of broom, furze, and other leguminous plants, has been employed as a detergent application to foul sores. Being without functional leaves, *Epifagus* cannot make its own food, but penetrates the roots of beech trees and lives as a parasite. (See BROOM RAPE.) For illustration, see Colored Plate of PARASITIC FLOWERING PLANTS.

CANCERIN, kán-kren', GEORG, COUNT (1774-1845). A Russian statesman. He was born at Hanau, Germany, and studied law and political economy at Giessen and Marburg. In 1796 he went to Russia, where his father was director of the salt mines of Staraya Russa, was first employed by him and then in the Ministry of the Interior. He subsequently entered the army and attracted attention by his writings on military subjects. In 1812 he was appointed commissary general of all the forces and in 1814 accompanied the Czar Alexander I to Paris. He was Minister of Finance from 1823 until 1844. Being an extreme Protectionist, his policies greatly stimulated many Russian industries. Besides, his financial management brought order into the then existing financial chaos. The unlimited issue of paper money sanctioned by him, however, paved the way for subsequent financial disaster. His chief works are: *International Wealth, National Wealth, and Political Economy* (1820) and *The Economy of Human Societies* (1845).

CANCERINITE. An orthosilicate of sodium, calcium, and aluminum generally found in yellow to white masses in syenite and other volcanic rocks, associated with elæolite and blue sodalite. Cancrinite is found in the Urals, in Norway, and at Litchfield and Gardiner, Me.

CANCERUM ORIS (Neo-Lat., from Lat. *cancer*, cancer + *oris*, Lat. gen. sing. of *os*, mouth), NOMA, or GANGRENOUS STOMATITIS. A gangrenous process which usually begins as an inflamed spot on the inside of the cheek near the corner of the mouth, whence it rapidly spreads, as a gangrenous process, involving the whole cheek, gums, jaw, and even the tongue and palate. It is fatal in 75 or 80 per cent of cases, death occurring from exhaustion or broncho-pneumonia. There are profound prostration, little or no fever, dullness, apathy, and sometimes diarrhœa, and an odor indescribably foul emanates from the ulcer. The disease occurs among children exhausted by severe illnesses, such as measles, scarlet fever, diphtheria, whooping cough, and principally in institutions. The immediate cause is infection from a fusiform bacillus and the spirillum of Vincent, associated with other pus-producing microorganisms. Some authorities consider noma and hospital gangrene identical. A similar process sometimes attacks the ear. Patients suffering from the affection should be isolated. The mouth should be carefully disinfected with peroxide of hydrogen or with a weak solution of potassium permanganate, and supporting and stimulating food and medicines should be given. Surgical treatment, if employed, consists in making a thorough excision of the diseased tissues with the knife or cautery. In nonfatal cases a line of de-

marcation appears, the dead tissue sloughs away, and healing takes place by granulation.

CANDABA, kân-dâ-bâ. A town of Luzon, Philippines, in the Province of Pampanga (Map: Luzon, E 6). It lies 12½ miles northeast of Bacolor, the capital of the province, and west of the Pinag de Candaba, an inland marsh of considerable size. The town was founded in 1578. Pop., 1903, 11,783.

CANDACE, kân'dâ-sê. The name of two or more queens of Ethiopia (q.v.)—i.e., Nubia—in Roman times. According to Pliny, Candace was the usual name for Ethiopian queens, or, rather, for the mother of the King. Two Candaces are known to history. One, a one-eyed virago, attempted to invade Egypt in 22 B.C., but the Roman Governor, Petronius, defeated her and penetrated to her capital, Napata, which he destroyed. Another Candace, who seems to have been a contemporary of Nero, is mentioned in Acts viii. 27 et seq., where it is stated that her treasurer was converted by Philip. Her residence was at Meröë.

CANDAHAR, kân'dâ-hâr'. See KANDAHAR.

CANDAULES, kân-dâ'lez. See GYGES.

CANDEISH, kân-dâsh'. See KHANDESH.

CANDELABRUM (Lat., from *candela*, a candle). A word signifying properly a candle-holder or candlestick, but frequently employed to mean a support for a lamp. The candelabra proper were of sufficient height to stand upon the floor. Though the forms vary greatly in details, the general shape is well defined. Those from Etruria have a base, usually formed of three feet of some animal, from which rises a slender shaft, often crowned by a statuette. Near the top four arms branch, terminating in spikes on which the candles were placed. A metal disk below the arms protected the hand, if it were needful to move the candelabrum. This pattern was easily modified to serve as a support for the small hand lamps, sometimes by placing flat plates on the top of the shaft and ends of the arms, sometimes by suspending the lamps by chains from the branches. Many bronze candelabra have been found in Etruria, Herculaneum, and Pompeii; these show great skill in the elaboration of the details. Among the most splendid examples are the great marble candelabra which seem to have been placed in temples or palaces or *thermæ*. These show a marble base, often richly decorated, from which rises a columnar shaft usually ending in a hollow, which may have served for oil or incense, or for the burning of resinous woods. Similar marble bases for the support of bronze candelabra are by no means infrequent. Examples of candelabra may be found in the plates of the *Museo Gregoriano* or in the works of Overbeck, *Pompeii in seinen Gebäuden, Alterthümern und Kunstwerken* (4th ed., Leipzig, 1884), and Maukelsey, *Pompeii: Its Life and Art* (New York, 1902).

CANDIA. See CRETE.

CANDIA, MEGALOKASTRO, or HERAKLEION. Formerly the capital of Candia, or Crete, on the north shore of the island, lat. 35° 20' N. and long. 25° 9' E. It is surrounded by fortifications built by the Venetians, but now out of repair; the town has been much injured by earthquakes. Candia occupies the site of the ancient Heracleion (Heracleum), the seaport of Cnosus. The present city was founded by the Saracens in the ninth century, was fortified in the twelfth century by the Genoese, and greatly strengthened by

the Venetians in the following three centuries. It was taken by the Turks in 1669, after a stubborn defense by the Venetians, who lost 30,000 men. Pop., 1900, 22,481.

CANDIDA. A play by George Bernard Shaw, produced in England in 1895, and considered generally his best drama. Candida, a warm-hearted woman, the wife of a clergyman totally absorbed in his work, is forced to choose between her husband and a young poet, who loves her. She displays a most astounding moral attitude, though remaining irreproachable in conduct.

CANDIDATE (Lat. *candidatus*, one dressed in the white toga, *toga candida*). In ancient Rome, an aspirant to one of the higher magistracies, as consul, tribune, ædile, or prætor. He was so called because of the white garment (of wool, made whiter by chalk) in which he appeared in public. During the period between the declaration of candidacy and the election—indeed, in many cases for a year or more before the election—occurred the *ambitio*, or canvassing of voters, which often gave occasion to enormous bribery (*ambitus*), in spite of severe enactments passed to prevent the corruption. The elected candidate was styled *designatus*. Consult the treatise known as *Quinti Ciceronis De Petitione Consulatus ad Marcum Tullium Fratrem*, printed with editions of Cicero's letters. Consult Greenidge, *Roman Public Life*, pp. 187, 188 (London, 1901).

In the early Christian Church newly baptized converts were styled candidates, on account of the white garments worn during the eight days after baptism. In modern times a German probationer or theological student who has been approved before the highest ecclesiastical authorities is called a candidate; but a still broader signification is, in English-speaking lands, also attached to the words, by which an applicant for any office whatever, religious or secular, is termed a candidate.

CANDIDE, OU L'OPTIMISME, kân'déd' 00 lóp'tém'és'm (Lat. *candidus*, shining). A pessimistic novel by Voltaire (1759), so named from its philosophic hero, Candide.

CANDLE (Lat. *candela*, from *candere*, to be white, glow). A cylinder of wax or fatty matter, with a wick, intended for giving light. Candles are made of tallow, the solid portion of palm and coconut oils, bleached wax, spermaceti, paraffin, and other oily substances found in coal, shale, and gas tar. They are either dipped, molded, or rolled. "Dips" are made by stretching a number of wicks upon a suitable frame, so that they may hang down at a distance from each other equal to about double the intended thickness of the candle; these are then dipped in a trough of melted tallow and hung upon a rack until cooled, then dipped again and again, until the required thickness is obtained. The dipper has a number of frames prepared before commencing the operation, and by the time he has dipped the last the first is cool enough to dip again. The tallow in the trough has to be kept only a little above its melting point, for if it were much hotter it would melt away a portion of the tallow already on the wick, instead of adding to it. Molds, or mold candles, are made by pouring the tallow into a metal tube, along the axis of which the wick has been previously fixed. These tubes are well polished in the inside, and several are fitted in a frame, the upper part of which forms a trough.

into which the molds all open. Thus, by pouring into the trough, all the molds are filled at once. As tallow is soft and burns with a smoky flame, it is only used for the cheaper grades of candles. Machine molding is now used in the manufacture of candles of all materials except those of wax, and machines capable of producing 96 candles at one operation are now employed, and even multiple machines whereby 518 candles at one filling can be made, it being possible to refill three times an hour.

Wax and ceresin candles are not molded, on account of the great amount of contraction which wax undergoes on cooling and the difficulty of removing it from the molds. Thus, in making altar candles, the wicks are warmed and suspended over a basin of melted wax, which is poured over them until they acquire the proper thickness; they are then rolled, while hot, between two flat pieces of smooth, hard wood, kept moist to prevent adhesion.

Pure stearic acid, or stearin, the chief fatty acid of tallow so largely used for candles, is a hard, crystalline substance, perfectly dry and free from any greasiness, with a somewhat pearly lustre. Its crystalline structure presents a difficulty in the manufacture of candles, for when cast in molds it contracts on cooling and leaves small spaces between the crystals. This has been obviated by mixing the stearin with a little wax or paraffin and pouring into hot molds.

Paraffin (q.v.), a white, crystalline body, obtained by distillation from certain natural hydrocarbons, affords a beautiful white and clear material for candles, and having thus, in a great degree, the properties of wax at a much smaller expense, it is much used for this purpose. *Ozocerite* (q.v.) is another oily mineral substance used for candles. For candles as standards of illumination, see PHOTOMETRY.

To obviate the necessity of snuffing candles, several devices have been adopted. In all of them the object is effected by causing the wick to bend over and its end to fall outside of the flame; and thus, by coming in contact with the oxygen of the air, to be completely burned—for such combustion cannot take place within the flames. Consult Calderwood, *Manufacture of Candles* (London, 1891); Lamborn, *Modern Soaps, Candles, and Glycerine* (London, 1906); Lewkowitsch, *Chemical Technology and Analyses of Oils, Fats, and Waxes*, vol. ii (London and New York, 1909).

For the use and signification of candles in religious worship, see LIGHTS, USE OF, IN PUBLIC WORSHIP.

CANDLE, ELECTRIC. See ELECTRIC LIGHTING.

CANDLEBERRY, BAYBERRY, WAX MYRTLE, or TALLOW TREE (*Myrica cerifera*). A small tree or shrub 4 to 18 feet high, but generally a low-spreading shrub, a native of the eastern coast region of the United States, but most abundant and luxurious in the South. It belongs to the family Myricaceæ, distinguished by naked flowers, a drupaceous fruit (stone fruit)—the scales becoming fleshy—and a single seed. The candleberry has evergreen, oblong, lanceolate leaves, with two small serratures on each side at the point, sprinkled with resinous dots. The bark and leaves when bruised emit a delightful fragrance. The small, dry drupes or nuts when ripe are covered with a greenish-white wax, which is collected by boiling them and skimming it off, and is afterward melted and

refined. A bushel of berries will yield four or five pounds. It is used chiefly for candles, which burn slowly, with little smoke, and emit an agreeable, balsamic odor, but do not give a strong light. An excellent scented soap is made from it. *Myrica gale* is the sweet gale of the moors and bogs of Scotland, well known for its delightful fragrance, a native of the northern parts of the world. Several species are found at the Cape of Good Hope, one of which, *Myrica cordifolia*, bears the name of wax shrub, and candles are made from its berries. *Myrica nagi*, a Japanese species, is a tree from 40 to 50 feet high that will withstand some frost. It produces an edible fruit and is cultivated to some extent in California. *Myrica asplenifolia* is common in the United States, where it is known as sweet fern. See TALLOW TREE.

CANDLEFISH, or EULACHON or OOLACHAN.

1. A fish (*Thaleichthys pacificus*) of the smelt family (Argentinidæ), nearly allied to the caplin (q.v.), and found on the Pacific coast of America from Oregon northward. (For illustration, see Plate of WHITEFISH, SMELTS, ETC.) It is 12 to 15 inches in length, has a somewhat pointed and conical head, and a large mouth. The color is greenish olive on the back, passing into silvery white on the sides and belly, sparsely spotted with dirty yellow. The flesh is very oily, but the oil has a fine flavor. It is an excellent pan fish, its flesh being far superior to that of the trout. Its oil is sometimes extracted and used as a substitute for cod-liver oil. The Alaskan Indians often use the dried fish as a lamp, by merely drawing through it a piece of rush pith or a strip from the inner bark of the cypress tree as a wick. Immense shoals of candlefish approach the shores and mouths of streams in spring and summer, when they are taken in large quantities by the Indians in canoes, by means of a flattened pole 8 to 12 feet long, having teeth originally of sharpened bone, but now of iron, set thickly along the edge of its outer end. This is swept through the school of fish, pricking and catching many, which are then skillfully tossed into the boat. The Indians formerly made extensive use of the oil rudely compressed from these fishes. Consult Swan, in *Proceedings United States National Museum*, vol. iii (Washington, 1881).

2. A local name in San Francisco for the Pacific coalfish (*Anoploma fimbria*). In California it is useless for food, being dry and tasteless, but in Alaska it becomes fat and is delicious eating. See COALFISH.

CANDLEMAS (Eng. *candle* + *mass*). In its ecclesiastical meaning, the feast of the purification of the Virgin Mary, observed on the 2d of February. In the fourth century it was observed on February 14, a date still kept by the Armenian church. This festival is very strictly kept by the Roman Catholic church, there being a procession with many lighted candles, and those required for the service of the ensuing year being also on that occasion consecrated; hence the name "Candlemas Day." In Scotland this day is one of the four term days appointed for periodical annual payments of money, interest, taxes, etc., and of entry to premises, the three other term days there being Whitsunday, Lammas, and Martinmas. See TERM.

An old document of the time of Henry VIII, preserved in the archives of the Society of Antiquaries, London, concerning the rites and ceremonies in the English church, speaks thus of

the custom of carrying candles: "On Candlemas daye it shall be declared that the bearyinge of candles is done in the memorie of Christe, the spirituall lyghte whom Simeon dyd prophecy [a light to lighten the Gentiles], as it is redde in the church that daye." But an older and heathen origin is ascribed to the practice. The Romans were in the habit of burning candles on this day to the goddess Februa, the mother of Mars; and Pope Sergius, seeing it would be useless to prohibit a practice of so long standing, turned it to Christian account by enjoining a similar offering of candles to the Virgin. The candles were supposed to have the effect of frightening the devil and all evil spirits away from the persons who carried them or from the houses in which they were placed. An order of council in 1584 prohibited the ceremony in England. There is a tradition in most parts of Europe to the effect that a fine Candlemas portends a severe winter. In Scotland the prognostication is expressed in the following distich:

"If Candlemas is fair and clear,
There'll be twa winters in the year."

Christ's Presentation, the Holiday of St. Simeon, and, in the north of England, the Wives' Feast Day, were names given to Candlemas Day. Consult Brand, *Popular Antiquities*, Bohn's ed. (London, 1849), and Duchesne, *Christian Worship* (London, 1904).

CANDLENUT (*Aleurites triloba*). A tree of the family Euphorbiaceæ, a native of the South Sea Islands, Madagascar, Molucca, Java, etc., which produces a nut with a very hard shell and a kernel edible when roasted, although in a raw state it possesses in a slight degree some of the active properties so common in the Euphorbiaceæ and is apt to cause purging. It is about as large as a walnut. An excellent fixed oil is procured from it, used both for food and as a lamp oil. It is a drying oil and has been used by artists. It is known as country walnut oil and kekune oil. A valuable dye is obtained from the fruit. The inhabitants of the Society Islands, after slightly baking these nuts in an oven and removing the shell, string them on rushes to be used for torches, which are made by inclosing four or five strings in a leaf of the screw pine (*Pandanus*). The lampblack used in tattooing was obtained from the shell of the candlenut. A gummy substance exudes from the candlenut tree, which the South Sea Islanders chew. The candlenut tree has been grown in Florida and California. *Aleurites cordata*, a species from the south of China, yields an excellent lac.

CANDLER, WARREN AKIN (1857-). An American bishop, born in Carroll Co., Ga. Educated at Emory College, he entered the North Georgia Conference of the Methodist Episcopal Church, South, in 1875. He was editor of the *Christian Advocate* in 1886-88 and was president of Emory College from 1888 to 1898, when he became Bishop. He was a delegate to the Ecumenical Conferences of 1891 and 1911. His works include: *History of Sunday Schools* (1890); *Georgia's Educational Work* (1893); *Christus, Auctor* (1899; 1907); *High Living and High Lives* (1901); *Great Revivals and the Great Republic* (1904); *Dangerous Donations and Degrading Doles* (1909); *Wesley and his Work* (1912); *Practical Studies in the Fourth Gospel* (1913).

CAND'LISH, ROBERT SMITH (1806-73). A

founder and leader of the Free church of Scotland. He was born in Edinburgh, studied in Glasgow, was licensed to preach in 1828, and from 1834 until his death was minister of St. George's, Edinburgh. In the General Assembly of 1839 he strongly declared in favor of the Free church party of the Established church, and in 1843 took a leading part in the formation of the independent body. From the death of Chalmers (1847) he was the controlling spirit of the Free church. He was moderator in the Assembly of 1861. In 1862 he became professor of divinity at New College. He improved the Free church school system and aided in forming the Evangelical Alliance (1845). His preaching was a remarkable combination of the intellectual, emotional, and dramatic. He wrote: *Contributions towards the Exposition of the Book of Genesis* (1842); *On the Atonement* (1845); *Examination of Mr. Maurice's Theological Essays* (1854); *Reason and Revelation* (1859); *The Two Great Commandments* (1860); and a posthumous volume of *Sermons* (1874). Consult the biography by Wilson and Rainy (Edinburgh, 1888).

CANDOLLE, KAN'döl', DE. See DE CANDOLLE.

CANDÓN, KAN-dón. A town of Luzon, Philippines, in the Province of Ilocos Sur (Map: Philippine Islands, C 2). It is situated 29 miles south of Vigan, near the coast, on which it has a port, and contains a telegraph station. The town dates from 1591. Pop., 1903, 18,828.

CANDOUR, MRS. A member of the *School for Scandal* in Sheridan's comedy of the latter title. Under the guise of a well-meaning frankness she is able to exceed even Backbite and Crabtree in acidity of speech.

CANDUC (N. African). A South African jackal. See JACKAL.

CANDY. See CONFECTIONERY.

CANDYS (Gk. *kándys*). A loose gown, worn by the Medes and Persians as well as the later Parthians over their other garments. It was a long flowing robe made of woolen cloth, which was either purple or of some other brilliant color, and had wide sleeves. In the sculptures at Persepolis, nearly all the personages are represented as so attired.

CANDYTUFT (Eng. *Candy*, archaic name for the island of Crete + *tuft*) (*Iberis*). A genus of plants of the family Cruciferae. The species are chiefly found in the countries surrounding the Mediterranean Sea, and the name "candytuft" is supposed to be derived from that of the island of Candia, the name *Iberis* from Iberia (Spain). One species, *Iberis amara*, remarkable for its bitterness, is a doubtful native of England. Some species are slightly shrubby, some are herbaceous perennials, some annuals. Candytuft is among the most familiar ornaments of our flower gardens, as the annual white and purple candytuft (*Iberis umbellata*), the sweet-scented candytuft (*Iberis odorata*), and two slightly shrubby species, *Iberis sempervirens* and *Iberis semperflorens*, the latter of which, in sufficiently warm situations, continues to blossom throughout the whole winter and is prized for the abundance and the perfect whiteness of its flowers. There are about a dozen well-known species of *Iberis*, all of which are represented in gardens by numerous cultural varieties.

CANE, or KEN, KAN. A river rising in Bundelkhand, India, near lat. 23° 54' N. and long. 80° 13' E., and after a north-northeast course of 230 miles entering the Jumna in lat. 25°

47' N. and long. 80° 35' E. (Map: India, C 4). It is generally too rapid and rugged for navigation, but during the rainy season is navigable from Banda, 30 miles above its confluence. It is remarkable for the matchless beauty of its pebbles. An important reservoir in its upper basin which impounds about 180,000,000 cubic feet of water irrigates about 374,000 acres in a region liable to drought.

CANEA, ká-ně'á, or **KHANIA**. The chief commercial town of Crete and capital of a province (Map: Greece, E 6). It is situated on the north coast and occupies the site of ancient Cydonia. The present city is of Venetian origin and dates from 1252 A.D., when a colony was sent from Venice to occupy it. The object of its foundation was to keep down the Greeks, who had been in arms and at open war with their Italian lords almost without intermission from the day when the Venetians first set foot on their shores. Venetian coats of arms are still observed over the doorways of some of the principal houses. Canea is surrounded by a strong wall and deep ditch, both of which, however, are in a state of great dilapidation; it has a good but very shallow harbor. Canea has large foundries, printing offices, and manufactures of oil, soap, wax, etc. Notable among its buildings are a number of Turkish mosques, Greek churches, a Jewish synagogue, and many relics of the Venetian period. Pop., 1906, 24,537.

CANE/RAKE. A dense growth of *Arundinaria macrosperma*, a large kind of reedy grass, indigenous to the warmer parts of the United States. It grows in marshy situations, where it attains a height of 10 to 30 feet. The flowers are in panicles. The young growth of this cane is used as fodder, but the quality is rather poor. The stems supply fishing rods, pipestems, splints for baskets, chair bottoms, mats, etc. *Arundinaria tecta*, a related species, is smaller and more hardy. It is found as far north as Maryland and southern Illinois.

CANE DELLA SCALA, ká'ná dē'lá ská'lá. See **SCALA**.

CANEL/TA (Neo-Lat., from ML. *canella*, cinnamon) (*Canella alba*). A small tree common in the West Indies and in the south of Florida, where it is often called wild cinnamon. The fruit is a small black berry. The whole tree is very aromatic, and its flowers are extremely fragrant. The bark of the young branches is the *Canella bark* of apothecaries, also known in commerce as whitewood bark and sometimes called white cinnamon. It forms a considerable article of export from the Bahamas. It has an aromatic fragrance, regarded as intermediate between that of cinnamon and that of cloves, and a bitterish, acrid, pungent taste. It is employed as a stomachic and stimulant tonic, and as an aromatic addition to tonics or to purgatives, in debilitated conditions of the digestive organs.

CANEPH'ORI, **CANEPH'OROI** (Lat., from Gk. κανηφόροι, *kanēphoroi*, basket bearers, from Gk. *káneon*, *kaneon*, basket of cane + *phérein*, *pherein*, to bear). Girls of Athens annually selected from the highest families to walk in the Panathenaic and other festival processions (see **GREEK FESTIVALS**), carrying on their heads baskets containing the implements and the apparatus necessary for a sacrifice. Their graceful attitudes (see the friezes of the Parthenon in the British Museum) suggested subjects for sculpture to some of the great artists of Greece.

Similar statues are also used in architecture to support light entablatures and are sometimes identified with caryatides (q.v.).

CANE SUGAR. See **SUGARS**.

CANES VENATICI (Lat., hunting dogs). A constellation of the Northern Hemisphere, added by Hevelius and known generally as the greyhounds of Hevelius. It lies just below the handle of the Dipper. The dogs are distinguished by the names Asterion and Chara. On the celestial globe they are represented as being held in leash by Boötes, and apparently pursuing Ursa Major round the pole of the heavens. The chief objects of interest in this constellation are the great Whirlpool nebula discovered by Lord Rosse in 1845, and a fine globular cluster of stars of the eleventh magnitude and fainter, which is notable for the large proportion—nearly one-seventh—of variables among them. Its principal star, to which Halley gave the name Cor Caroli (the Heart of Charles II), is a double star with components of the third and sixth magnitudes.

CANETE, ká-nyá'tá, **MANUEL** (1822-91). A Spanish poet, dramatic writer, and critic, born in Seville. His works include his lyrics *Poesías* (1859), which possess the pathetic quality of the verses of the old Sevillian school, but are marred by their unnatural and declamatory tone; and a number of dramas, which have received high praise: *Un rebato en Granada* (1845); *El duque de Alba* (1845); and *La esperanza de la patria* (with Tamayo). He is celebrated chiefly, however, as a dramatic critic and served as such on the *Ilustración Española y Americana* from 1883 until his death. In this capacity, too, he published, among other works, editions of the *Farsas y églogas* of Lucas Fernandez (1867); of *La tragedia llamada Josefina* (1870); *Teatro español del siglo XVI* (1885); and *Escritores españoles é hispano-americanos* (1884). He held a leading position for years on two exceedingly important permanent commissions—that of historic and artistic monuments, and that of the inspection of museums in the Academia de Bellas Artes de San Fernando. In 1883 he was decorated with the Grand Cross of the Order of Isabella the Catholic, and for years before his death served as secretary to the Infanta Doña Isabel, sister of Alfonso XII.

CANEY, ká'ní. A city in Montgomery Co., Kans., 144 miles (direct) south by west of Topeka, on the Atchison, Topeka, and Santa Fe and the Missouri Pacific railroads (Map: Kansas, G 8). It contains glass works, smelting plants, oil refineries, flouring mills, and a brick factory. The water works are owned by the city. Pop., 1900, 887; 1910, 3597.

CANEY, ká'ná, **EL**. See **EL CANEY**.

CANFIELD, **JAMES HULME** (1847-1909). An American educator. He was born at Delaware, Ohio, graduated in 1868 at Williams College (which made him a doctor of laws in 1893), and in 1872 was admitted to the bar of Michigan. He practiced law from 1872 to 1877, was a professor at the University of Kansas from 1877 to 1891, and in 1891 became chancellor of the University of Nebraska. He was president of the Ohio State University from 1895 to 1899, and was then for a time librarian of Columbia University, New York. He received the degree of Litt.D. from Oxford in 1902. His publications include: *Taxation: A Plain Talk for Plain People* (1893); *A Short History of Kansas* (1885); *Local Government in Kansas*

(1887); *The College Student and his Problems* (1902).

CANG, CANGUE, or KIA. An instrument of degrading punishment in use in China. It consists of a large wooden collar fitting close round the neck, the weight of which is usually from 50 to 60 pounds. Over the parts where the cang fastens are pasted slips of paper, on which the mandarin places his seal, so that the culprit may not be relieved until the full term of his sentence has expired, which sometimes extends to 15 days. On the cang is also inscribed, in large letters, the offense and the duration of the punishment. The criminal, having been paraded through the streets by the police, is then left exposed in some thoroughfare of the city or at the place where the crime was committed. As he is incapable of using his hands, he has to be fed during the time he is suffering the penalty.

CANGA ARGÜELLES, kã'gã ärgwã'lyäs, José (1770-1843). A Spanish statesman. He was an active opponent of Napoleon, did his best to foment the Spanish insurrection against the French armies, and became an energetic member of the Cortes of 1812, but on the return of the Bourbons was exiled. Under the restoration of the Constitution of 1812 in 1820, he was made Minister of Finance, and in this position effected many important reforms. He resigned in 1821. After the overthrow of the Constitution in 1823 he went to England, but returned to Spain in 1829 and was appointed keeper of the archives at Simancas. He was the author of *Elementos de la ciencia de hacienda* (1825); *Diccionario de hacienda, con aplicación á España* (1827; 2d ed., 2 vols., Madrid, 1833-34); and *Observaciones sobre la guerra de la Península* (5 vols., 1833-36), under which modest title he challenged the statements of certain British historians of that war to the effect that all the credit for its conduct was due to the British troops; for he showed the infinite sacrifices that Spain had imposed upon herself during that memorable struggle. During his early youth he had given himself to poetry, and not the least of his achievements is a verse translation of the Odes of Sappho.

CÁNGAS DE ONÍS, kã'gãs dã ð-nés'. A town of Spain, in the Province of Oviedo, 35 miles east of the city of Oviedo (Map: Spain, C 1). It is known chiefly for its connection with the famous Pelayo (q.v.), and the reconquest of Spain from the Moors. A Latin inscription on the town hall states that this city was the first residence of Spanish kings after the Moors had overrun the land. The historic Cave of Covadonga, in which Pelayo took refuge, is only 8 miles away. There are interesting churches in this vicinity, one containing the tomb of Alfonso I. Inscriptions and remains of bridges indicate that Cãgas de Onís was of some importance under the Romans, but its identity has not been fixed. Pop., 1900 (commune), 8559; 1910, 9103.

CÁNGAS DE TINEO, kã'gãs dã tẽ-nã'ô. A town of north Spain, in the Province of Oviedo, on the Río Narcea, 37 miles southwest of Oviedo (Map: Spain, B 1). It is surrounded by high hills and possesses an interesting bridge. Though the adjacent region is rough and mountainous, it is well watered, and agriculture and stock raising are carried on. There are manufactures of liquors, flour, and linen and woolen goods. Pop., 1900 (commune), 23,658; 1910, 24,103.

CANGE, kãnz̃h, Dũ. See Dũ CANGE.

CAN GRANDE DELLA SCALA, kãn grãn'-dã dël'lã skũ'lã. See SCALA.

CANICATTI, kã'nẽ-kãt'tẽ. A city in the Province of Girgenti, Sicily, 28 miles north of Licata, in a rocky valley 1500 feet above the sea (Map: Italy, H 10). It has a technical school, and the country produces grain, wine, and fruit, and contains sulphur mines. Pop. (commune), 1881, 20,000; 1901, 24,564; 1911, 31,204.

CANICHANA, kã'nẽ-chã'nã. A tribe formerly residing upon the Mamoré River, Bolivia, between 13° and 14° south, and on the Machupo from its mouth to the present mission of San Joaquin. They were once savage and brutal cannibals living in fortified villages, from which they made constant raids upon their more peaceable neighbors. Notwithstanding their savage character, they willingly accepted the Jesuit missionaries and are now gathered into the mission villages of San Pedro and Trinidad. They were visited by Heath in 1880, Balzan in 1892, and earlier by D'Orbigny in 1830. Their language forms a distinct stock. Consult "La langue Kanichana," by G. de Créqui-Montfort and P. Rivet, in the *Mémoires de la Société de Linguistique de Paris*, 1913, vol. xviii, pp. 354-377.

CANIC'ULA (Lat. *canicularis*, from *caniculus*, little dog), **CANICULAR DAYS, or Dog Days, CANICULAR YEAR.** Canicula was an old name of the constellation Canis Minor; it was also used to denote Sirius, or the dog star, the largest and brightest of all the stars, which is situated in the mouth of Canis Major. From the heliacal rising (q.v.) of this star (Sirius) the ancients reckoned their dog days, or *dies caniculares*, which were 40 in number—20 before and 20 after the rising of the star. The rising of the dog star was supposed to be the occasion of the extreme heat and the diseases incidental to these days. It was by mere accident that the rising of the star coincided with the hottest season of the year, in the times and countries of the old astronomers. The time of its rising depends on the latitude of the place, and is later and later every year in all latitudes, owing to precession. In time the star may rise in the dead of winter. The canicular year was that known among the Egyptians and Ethiopians. It was computed from one heliacal rising of Sirius to the next, and consisted ordinarily of 365 days and every fourth year of 366. This year is sometimes called the heliacal year. The reason for computing the year from the rising of Sirius seems to have been that, at the time, the heliacal rising coincided with the greatest swelling of the Nile.

CANIDÆ (Neo-Lat., from Lat. *canis*, dog). A family of carnivores, the dog tribe, now usually classified between the hyenas and the bears. Their whole organization fits them to be less exclusively carnivorous than the feline tribe. They have generally three incisors or cutting teeth, with one large canine tooth, and four premolars on each side of the jaw, two true molars on each side in the upper jaw, and three in the lower. The true molars are adapted for crushing either bones or vegetable food. The last premolars in the upper jaw are remarkably large and particularly adapted for cutting flesh. The legs are comparatively long, the claws are nonretractile, and with one exception (*Lycæon*) the toes are five in front and four behind. The thumb is small and considerably above the other digits.

DOG FAMILY - CANIDÆ



1 BLUE FOX - VULPES LAGOPUS (SUMMER COAT) 3 GRAY WOLF - CANIS OCCIDENTALIS
 2 RED FOX - VULPES FULVUS 4 COYOTE - CANIS LATRANS
 ABOUT 1/2 NATURAL SIZE

The muzzle is long, the ears generally erect and pointed, and the tail more or less bushy. A peculiarity of the dogs is their habit of association in packs and of pursuing their prey mainly by scent. In this sense they are extremely keen, they have good eyesight and hearing, and most of them are diurnal. They frequent open uplands, by preference, some climbing trees, and, though mostly good swimmers, they avoid aquatic pursuits. Most of them occupy dens or burrows, often dug by themselves and sometimes placed in groups. See DOG; FENNEC; FOX; FOX DOG; JACKAL; HUNTING DOG; WOLF; ETC.

CANINA, ká-né'ná, LUIGI (1795-1856). An Italian architect and archæologist, born at Casale. He was professor of architecture in Turin and superintended the excavation of Tusculum (Frascati) in 1839 and of the Appian Way in 1848. He wrote many works on ancient architecture and on Etruscan and Roman archæology, among which are: *Indicazione di Roma antica* (1830); *L'Architettura antica descritta e dimostrata coi monumenti* (1839-46); *Antica Etruria marittima* (1846-51); *Foro Romano* (1845); *Storia e topografia di Roma antica* (1839-48). He published also a number of plans and maps of his discoveries. His works are magnificently illustrated, but must be used with great caution, since his restorations are often wholly imaginative, and even his drawings of actual remains are marred by many inaccuracies.

CANINES, ká'nírz, or CANINE TEETH. See TEETH.

CANINI, ká-né'né, MARCO ANTONIO (1822-91). An Italian publicist and poet, born in Venice. He studied law at Padua, but the troubles of 1847-48 drove him into exile in Greece and the Balkan states, his knowledge of which was later of use to the Rattazzi ministry. He later fought with Garibaldi and as a journalist reported the Russo-Turkish War of 1877-78. He enjoyed a vogue in his own day for his verses, *Mente, fantasia e cuore* (1852), *Sonetti* (1873), *Odi saffiche* (1879), and *Amore e dolore* (1880). He also wrote various articles and books on Balkan questions. Consult his autobiography, *Vingt ans d'exil*.

CANISIUS, ká-nish'i-ús, PETRUS (a Latin translation of his Dutch name, De Hond) (1521-97). A Jesuit theologian who took a prominent part in the Council of Trent. He was born in Nimwegen, May 8, 1521, and was educated in Cologne and Louvain. He was the first German to join the Jesuit Order (1543); became professor of theology in Ingolstadt, 1549; was preacher to Ferdinand I in Vienna and became the first provincial of the Jesuits in Germany (1556). He established colleges of the order in Prague, Freiburg (Switzerland), Augsburg, and Dillingen and powerfully contributed to the check of the spread of Protestantism which the Counter Reformation effected. To this end he drew up in 1554, in Latin, a catechism which should take the same place as Luther's; it has been very widely used, has passed through more than 400 editions, and has been translated into French, German, and English. He died in Freiburg, Switzerland, Dec. 21, 1597, and was beatified in 1864. For his life, consult: Reiss (Freiburg, 1865); P. Drews (Halle, 1892); J. B. Mehler (Berlin, 1897); L. Michel (Lille, 1898); A. Kross, *Canisius in Oesterreich* (Vienna, 1898); also, his *Epistola et Acta*, ed. O. Braunsberger (8 vols., Freiburg, 1896 et seq.).

CANIS MAJOR (Lat., the Greater Dog).

A constellation of the Southern Hemisphere, below the feet of Orion. It contains Sirius, the brightest of all the stars, and its place may be found by means of this star, which is on the continuation of the line through the belt of Orion.

CANIS MINOR (Lat., the Lesser Dog). A constellation of the Northern Hemisphere, lying to the east of Orion and just below Gemini. Procyon, of the first magnitude, is its principal star and lies almost in a direct line between Sirius and Pollux, so that the position of the constellation may be found by means of this star. Its parallax, as measured by Elkin at Yale, is 0".334, corresponding to a distance of almost 10 light years. Procyon is accompanied by a faint companion of the 13th magnitude, the period of revolution of the pair about each other being about 40 years.

CANISTER (Lat. *canistrum*, reed basket, Gk. *κάνιστρον*, *kanistrón*, wicker basket, from *κάννα*, *kanna*, reed). A form of projectile. For smoothbore guns and for the earlier rifles, canister consisted of a cylindrical tin or sheet-iron case filled with small cast-iron balls half an inch to one inch in diameter. The ends were usually wooden disks over which the tin or iron was crimped and tacked down; the interstices between the balls were either filled with sawdust or like material, or the balls were sunk in holes in soft wooden disks, which were piled one upon the other. When fired, the container broke and the balls were scattered very much in the manner of a charge of shot from a fowling piece. It is rarely used in modern rifled guns, though there is a tendency towards supplying canister for the close-range operations of gunboats in rivers and contracted waters, as well as for field pieces. See ARTILLERY; FIELD ARTILLERY; GUNS, NAVAL; PROJECTILES; SHRAPNEL; ORD-NANCE; ETC.

CANITZ, ká'níts, FRIEDRICH RUDOLF LUDWIG, BARON VON (1654-99). A Prussian statesman and unimportant poet. He was born in Berlin and belonged to an ancient Brandenburg family. In 1698 he was made a baron, and, after serving in various diplomatic missions, was Minister Plenipotentiary of The Hague during the formation of the Grand Alliance (q.v., and see SUCCESSION WARS). His poems, consisting of odes, satires, and elegies, in imitation of Boileau, were published after his death by J. Lange, under the title of *Nebenstunden unterschiedener Gedichte* (1700, without the author's name; with Canitz's name, 1719). His most popular poem is his elegy written on the death of his wife, Dorothea or Doris von Arnim, who died in 1695. Consult: König, *Des Freiherrn von Canitz Gedichte*, with a biographical sketch (Leipzig, 1727); selections from his works in the *Bibliothek deutscher Dichter des 17 Jahrhunderts*, vol. xiv (Leipzig, 1838); Varnhagen von Ense, *Biographische Denkmale*, vol. iv (Berlin, 1824-45); and Lutz, *Canitz und sein Verhältnis zu dem französischen Klassicismus* (Munich, 1887).

CANKER (Lat. *cancer*, cancer). A disease of the horse's hoof caused by the rapid reproduction of a vegetable parasite. It not only destroys the sole and frog, but, through setting up a chronic inflammation in the deeper parts, prevents the growth of healthy horn by which the injury may be repaired. The disease is usually confined to one foot, but may attack two, three, or all of the feet at once or in succession.

Symptoms.—It usually commences by discharge from the heels or the cleft of the frog of the horse's foot. The horn becomes soft and disintegrated, the vascular structures beneath become inflamed, and the pain which the animal endures is severe, making it very lame. Though there is no constitutional fever, the horse becomes emaciated and unfit for work. During wet weather and on damp soil the symptoms increase in severity. The soft structures bleed on the least touch, and considerable fungous granulations form rapidly. Dirt, cold, and wet favor the production of the disease, and there is always a tendency to relapse when once an animal has been affected.

Treatment.—The foot should first be cleaned with warm baths, after which a poultice containing charcoal or carbolic acid is to be applied. The diseased portions of the horn should be pared away until only healthy horn borders the affected parts. In mild cases sprinkle powdered acetate of copper over the sore; apply over this pledgets of tow, fixed over the foot by strips of iron or wood passed between shoe and foot. In severe cases tar and nitric acid, creosote and turpentine, chloride of zinc paste, or other active caustics have to be used for a time, with the regular employment of pressure on the diseased surface. The animal requires to be treated constitutionally by periodical purgatives and tonics or alteratives. Good food, fresh air, and exercise often aid much in the treatment of the disease.

CANKER. A disease of forest and orchard trees characterized by the roughening and splitting of the bark and the gradual dying of the limb or tree. Originally only certain fungous diseases of trees were called by this name, but it has been extended to include many diseases of plants where there is a manifest wound or abnormal development of tissues. In Europe the larch canker, *Dasyscypha calycina*, is especially injurious to larch, fir, and pine trees. The fungus *Nectria ditissima* is the cause of the so-called European apple-tree canker; the Illinois apple-tree canker is due to *Nummularia discreta*; the Oregon apple canker to *Glaeosporium malicorticis*; and the New York apple canker to *Sphaeropsis malorum*. The bitter rot fungus, *Glomerella rufomaculans*, forms cankers on apple trees from which the fungus spreads to the fruit. The bacterial blight of pears, apples, etc., has lately been found to form cankers on tree trunks, which become centres of infection. Cutting out the cankers, treatment of wounds, and timely spraying with Bordeaux mixture or lime sulphur is advised.

CANKER SORE. A small, yellow, round or linear ulcer, very tender, occurring on the under side of the tongue or inner surface of the lips or cheeks. It is temporary and only local and may be removed by the application of silver nitrate or pure carbolic acid. It develops chiefly among children and is generally caused by digestive derangements.

CANKERWORM. A gregarious caterpillar of either of two moths of the geometrid family Monocteniidae. One is on the wing in the autumn and the other in the spring. The moths of the spring cankerworm (*Paleacrita vernata*) come forth from the chrysalis in the spring, but a few of them appear in the fall or on warm days of winter. The moths of the autumn cankerworm (*Anisopteryx pometaria*) emerge during October. Some few may delay coming out

until warm days in winter. The moths of both sexes of the autumn cankerworm differ from those of the spring form in the absence of abdominal spines. The autumn form pupates in the ground in well-spun cocoons, while the cells of the spring forms are lined with only a few threads of silk. The body of the caterpillar of the autumn form is marked by six light longitudinal bands, and that of the spring form by eight. The eggs of the autumn form are laid in regular rows or masses and are truncated in form, while those of the spring brood are ovoid and are laid in irregular bunches. Both forms agree in that the caterpillars feed on the leaves of fruit and shade trees and descend to the ground to pupate. The female moths of both forms are wingless. The caterpillars are so voracious that they may denude whole orchards or groves of trees in a few days as though a flame had swept through, whence has arisen the local name "fireworm." This is the worm that strips currant bushes of leaves in the spring, and it was to combat this caterpillar that the English house sparrow was introduced into the United States; but it checked the cankerworms but little. (See HOUSE SPARROW.) The wingless females may be caught as they creep up the trunk of a tree by bands of tarred paper or other sticky substance wrapped about the trunk of the tree. Shade trees may be sprayed with Paris green in water, but this poison must be used with caution on fruit trees.

CANNA (Lat., Gk. *kánva*, *kanna*, reed). A genus of succulent herbs of the family Scitamineaceæ, natives of warm countries in both hemispheres, and extensively cultivated as foliage plants for heavy or mass effects. The stem is 3 to 14 feet high, unbranched; the leaves are large; the flowers are mostly red or yellow and borne irregularly in a terminal raceme or panicle. Many varieties are in cultivation. The dwarf (seldom exceeding 4 feet), large-flowered, French, and Italian varieties are most in favor, and are much used as centrepieces in formal beds and in small clumps in borders. Cannas are propagated either from seed (new varieties) or by dividing the rootstock and planting in pots. They are of easy culture. A rich, warm soil with plenty of moisture is desirable. When wanted for mass effects, they are set about 6 inches apart each way, after danger of frost is past. The flowers should be picked as soon as they wilt, to prevent the formation of seed, and thus prolong the flowering season. After the stalks are cut in the fall, the roots are stored and handled like potatoes until wanted for planting. The roots of some species of canna, especially *C. edulis*, contain considerable amounts of starch. *Canna coccinea* is sometimes used to supply starch. See Plate of CAMELLIA, ETC.

CANNABICH, kán'ná-bík, CHRISTIAN (1731-98). A German composer and orchestral conductor. He was born in Mannheim, where his father was a flutist in the orchestra of the Elector. He studied violin with Jomelli and composition with Stamitz. In 1757 he became concert master and in 1775 conductor of the orchestra, which under his leadership became world famous for a variety of dynamic shading before then unheard of. He is practically the first conductor who introduced the crescendo and decrescendo as a means of expression. His compositions, though lacking both depth and originality, were important at the time because they materially

helped in spreading the new instrumental style and forms originated by Stamitz, the real father of modern instrumental music. Cannabich wrote much chamber music, several ballets and operas, and almost 100 symphonies.

CANNABICH, kân'nâ-bîk, JOHANN GÜNTHER FRIEDRICH (1777-1859). A German geographer, born in Sondershausen. He studied at the University of Jena, was in 1807 appointed rector of the town school in Greussen, in 1819 became pastor in Niederbüsa, and in 1835 in Bendeleben. His *Lehrbuch der Geographie* (1816; 18th ed., 2 vols., 1870-75) has been widely circulated in Germany. His other works include: *Statistische Beschreibung des Königreichs Württemberg* (1828); *Neuestes Gemälde von Frankreich* (1831); *Neuestes Gemälde des europäischen Russland und des Königreichs Polen*; *Hilfsbuch beim Unterricht in der Geographie* (3 vols., 1833-38).

CANNABIS. See HEMP.

CANNÆ (Lat., Gk. *kánnai*, *kannai*, reeds). An ancient town of south Italy, on the right bank of the Aufidus (Ofanto), the site of which is 9 miles west of Barletta. Here on Aug. 2, 216 B.C. (by the uncorrected calendar, which was two months in advance of the actual season), Hannibal, with 40,000 foot and 10,000 horse, inflicted a terrible defeat on a Roman army consisting of 80,000 foot and 6000 horse, under the consuls Lucius Æmilius Paulus and Gaius Terentius Varro. The contest began with the right Roman and the left Carthaginian wing resting on the river—on the left bank of the river, according to a well-supported view. Hannibal arrayed his forces in the form of a crescent, with the weakest part of his infantry, the Spaniards and the Gauls, in the centre; he commanded there in person. It was his purpose that when the strongest part of the Romans should attack the centre, they would repulse the Iberians and Gauls and press forward in thick column. His plan worked perfectly; the Romans charged, repulsed the Carthaginian centre, and pressed on in pursuit. The Libyans on the Carthaginian wings swung round and attacked the Romans on both flanks. The Carthaginian cavalry also soon overwhelmed the Roman horse, and then fell upon the Roman foot from the rear. Varro, with 70 knights, escaped to Venusia, and a few thousand Romans assembled at Canusium from the rout; but at least 10,000 were captured and an immense number killed, among them Æmilius Paulus. It is to be noted that some good authorities put the battle on the right bank of the river. Consult: Reusch, *Die Schlacht bei Cannae* (Altkirch, 1888); Solbesky, *Die Schlacht bei Cannae* (Weimar, 1888); Wilms, *Die Schlacht bei Cannae* (Hamburg, 1895); Fry, *English Historical Review*, xii, pp. 749 ff. (1897); Fried, *Ueber die Schlacht bei Cannae* (Leipzig, 1898); Schwab, *Das Schlachtfeld von Cannae* (Munich, 1898); and Pauly-Wissowa, *Real-Encyclopädie der classischen Altertumswissenschaft*, vii, p. 2235 (1912).

CANNAN, EDWIN (1861-). An English economist, educated at Balliol College, Oxford. He became lecturer at the London School of Economics in 1897, and professor of political economy in the University of London in 1907. Besides editing Adam Smith's *Lectures on Justice, Police, Revenue, and Arms* (1896), and his *Inquiry into the Nature and Causes of the Wealth of Nations* (2 vols., 1904), he is author of *Elementary Political Economy* (1888; 3d ed., 1903); *History of the Theories of Production*

and Distribution (1893; 2d ed., 1903); *History of Social Rates in England* (1896; 2d ed., 1912); *The Economic Outlook* (1912); *Wealth* (1914).

CANNEL COAL (said to have turned in the drawling pronunciation of the miners from *candle-coal*, as it burns with a bright, candle-like flame). A dull, fine-grained variety of non-coking bituminous coal, which has a conchoidal fracture. Owing to its very high percentage of volatile hydrocarbons, it is specially valuable for gas making. An analysis of Kentucky cannal gave: volatile matter, 51.60; fixed carbon, 40.40; ash, 7.00; sulphur, .739; moisture, 1.00. It is considered by some to be derived from the accumulation of animal as well as plant remains. In the United States the Breckenridge cannal coal of eastern Kentucky is the most noted occurrence, though it is also found in Ohio and Indiana. Some is also found in Scotland and is there known as parrot coal. See COAL.

CANNELTON. A city and the county seat of Perry Co., Ind., 150 miles (direct) south by west of Indianapolis, on the Ohio River and on the Southern Railroad (Map: Indiana, D 9). It has fine county buildings. The city is an important industrial centre and has cotton mills, flour mills, a foundry and machine shop, and manufactures sewer pipe, pottery, bricks, etc. There are coal mines and sandstone quarries in the vicinity. Gas and oil also are found. The water works and electric light plant are owned by the city. Pop., 1900, 2188; 1910, 2136.

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Symptoms.—It usually commences by discharge from the heels or the cleft of the frog of the horse's foot. The horn becomes soft and disintegrated, the vascular structures beneath become inflamed, and the pain which the animal endures is severe, making it very lame. Though there is no constitutional fever, the horse becomes emaciated and unfit for work. During wet weather and on damp soil the symptoms increase in severity. The soft structures bleed on the least touch, and considerable fungous granulations form rapidly. Dirt, cold, and wet favor the production of the disease, and there is always a tendency to relapse when once an animal has been affected.

Treatment.—The foot should first be cleaned with warm baths, after which a poultice containing charcoal or carbolic acid is to be applied. The diseased portions of the horn should be pared away until only healthy horn borders the affected parts. In mild cases sprinkle powdered acetate of copper over the sore; apply over this pledgets of tow, fixed over the foot by strips of iron or wood passed between shoe and foot. In severe cases tar and nitric acid, creosote and turpentine, chloride of zinc paste, or other active caustics have to be used for a time, with the regular employment of pressure on the diseased surface. The animal requires to be treated constitutionally by periodical purgatives and tonics or alteratives. Good food, fresh air, and exercise often aid much in the treatment of the disease.

CANKER. A disease of forest and orchard trees characterized by the roughening and splitting of the bark and the gradual dying of the limb or tree. Originally only certain fungous diseases of trees were called by this name, but it has been extended to include many diseases of plants where there is a manifest wound or abnormal development of tissues. In Europe the larch canker, *Dasyscypha calycina*, is especially injurious to larch, fir, and pine trees. The fungus *Nectria ditissima* is the cause of the so-called European apple-tree canker; the Illinois apple-tree canker is due to *Nummularia discreta*; the Oregon apple canker to *Gloeosporium malicorticis*; and the New York apple canker to *Sphaeropsis malorum*. The bitter rot fungus, *Glomerella rufomaculans*, forms cankers on apple trees from which the fungus spreads to the fruit. The bacterial blight of pears, apples, etc., has lately been found to form cankers on tree trunks, which become centres of infection. Cutting out the cankers, treatment of wounds, and timely spraying with Bordeaux mixture or lime sulphur is advised.

CANKER SORE. A small, yellow, round or linear ulcer, very tender, occurring on the under side of the tongue or inner surface of the lips or cheeks. It is temporary and only local and may be removed by the application of silver nitrate or pure carbolic acid. It develops chiefly among children and is generally caused by digestive derangements.

CANKERWORM. A gregarious caterpillar of either of two moths of the geometrid family *Monoctenidae*. One is on the wing in the autumn and the other in the spring. The moths of the spring cankerworm (*Paleacrita vernata*) come forth from the chrysalis in the spring, but a few of them appear in the fall or on warm days of winter. The moths of the autumn cankerworm (*Anisopteryx pomataria*) emerge during October. Some few may delay coming out

until warm days in winter. The moths of both sexes of the autumn cankerworm differ from those of the spring form in the absence of abdominal spines. The autumn form pupates in the ground in well-spun cocoons, while the cells of the spring forms are lined with only a few threads of silk. The body of the caterpillar of the autumn form is marked by six light longitudinal bands, and that of the spring form by eight. The eggs of the autumn form are laid in regular rows or masses and are truncated in form, while those of the spring brood are ovoid and are laid in irregular bunches. Both forms agree in that the caterpillars feed on the leaves of fruit and shade trees and descend to the ground to pupate. The female moths of both forms are wingless. The caterpillars are so voracious that they may denude whole orchards or groves of trees in a few days as though a flame had swept through, whence has arisen the local name "fireworm." This is the worm that strips currant bushes of leaves in the spring, and it was to combat this caterpillar that the English house sparrow was introduced into the United States; but it checked the cankerworms but little. (See HOUSE SPARROW.) The wingless females may be caught as they creep up the trunk of a tree by bands of tarred paper or other sticky substance wrapped about the trunk of the tree. Shade trees may be sprayed with Paris green in water, but this poison must be used with caution on fruit trees.

CAN'NA (Lat., Gk. *kánna*, *kanna*, reed). A genus of succulent herbs of the family Scitamineaceæ, natives of warm countries in both hemispheres, and extensively cultivated as foliage plants for heavy or mass effects. The stem is 3 to 14 feet high, unbranched; the leaves are large; the flowers are mostly red or yellow and borne irregularly in a terminal raceme or panicle. Many varieties are in cultivation. The dwarf (seldom exceeding 4 feet), large-flowered, French, and Italian varieties are most in favor, and are much used as centrepieces in formal beds and in small clumps in borders. Cannas are propagated either from seed (new varieties) or by dividing the rootstock and planting in pots. They are of easy culture. A rich, warm soil with plenty of moisture is desirable. When wanted for mass effects, they are set about 6 inches apart each way, after danger of frost is past. The flowers should be picked as soon as they wilt, to prevent the formation of seed, and thus prolong the flowering season. After the stalks are cut in the fall, the roots are stored and handled like potatoes until wanted for planting. The roots of some species of canna, especially *C. edulis*, contain considerable amounts of starch. *Canna coccinea* is sometimes used to supply starch. See PLATE OF CAMELLIA, ETC.

CANNABICH, kán'ná-bík, CHRISTIAN (1731-98). A German composer and orchestral conductor. He was born in Mannheim, where his father was a flutist in the orchestra of the Elector. He studied violin with Jomelli and composition with Stamitz. In 1757 he became concert master and in 1775 conductor of the orchestra, which under his leadership became world famous for a variety of dynamic shading before then unheard of. He is practically the first conductor who introduced the crescendo and decrescendo as a means of expression. His compositions, though lacking both depth and originality, were important at the time because they materially

helped in spreading the new instrumental style and forms originated by Stamitz, the real father of modern instrumental music. Cannabich wrote much chamber music, several ballets and operas, and almost 100 symphonies.

CANNABICH, kân'nâ-bîk, JOHANN GÜNTHER FRIEDRICH (1777-1859). A German geographer, born in Sondershausen. He studied at the University of Jena, was in 1807 appointed rector of the town school in Greussen, in 1819 became pastor in Niederbüsa, and in 1835 in Bendeleben. His *Lehrbuch der Geographie* (1816; 18th ed., 2 vols., 1870-75) has been widely circulated in Germany. His other works include: *Statistische Beschreibung des Königreichs Württemberg* (1828); *Neuestes Gemälde von Frankreich* (1831); *Neuestes Gemälde des europäischen Russland und des Königreichs Polen*; *Hilfsbuch beim Unterricht in der Geographie* (3 vols., 1833-38).

CANNABIS. See HEMP.

CANNÆ (Lat., Gk. *kánnai*, *kannai*, reeds). An ancient town of south Italy, on the right bank of the Aufidus (Ofanto), the site of which is 9 miles west of Barletta. Here on Aug. 2, 216 B.C. (by the uncorrected calendar, which was two months in advance of the actual season), Hannibal, with 40,000 foot and 10,000 horse, inflicted a terrible defeat on a Roman army consisting of 80,000 foot and 6000 horse, under the consuls Lucius Æmilius Paulus and Gaius Terentius Varro. The contest began with the right Roman and the left Carthaginian wing resting on the river—on the left bank of the river, according to a well-supported view. Hannibal arrayed his forces in the form of a crescent, with the weakest part of his infantry, the Spaniards and the Gauls, in the centre; he commanded there in person. It was his purpose that when the strongest part of the Romans should attack the centre, they would repulse the Iberians and Gauls and press forward in thick column. His plan worked perfectly; the Romans charged, repulsed the Carthaginian centre, and pressed on in pursuit. The Libyans on the Carthaginian wings swung round and attacked the Romans on both flanks. The Carthaginian cavalry also soon overwhelmed the Roman horse, and then fell upon the Roman foot from the rear. Varro, with 70 knights, escaped to Venusia, and a few thousand Romans assembled at Canusium from the rout; but at least 10,000 were captured and an immense number killed, among them Æmilius Paulus. It is to be noted that some good authorities put the battle on the right bank of the river. Consult: Reusch, *Die Schlacht bei Cannæ* (Altkirch, 1888); Solbesky, *Die Schlacht bei Cannæ* (Weimar, 1888); Wilms, *Die Schlacht bei Cannæ* (Hamburg, 1895); Fry, *English Historical Review*, xii, pp. 749 ff. (1897); Fried, *Ueber die Schlacht bei Cannæ* (Leipzig, 1898); Schwab, *Das Schlachtfeld von Cannæ* (Munich, 1898); and Pauly-Wissowa, *Real-Encyclopädie der classischen Altertumswissenschaft*, vii, p. 2235 (1912).

CANNAN, EDWIN (1861-). An English economist, educated at Balliol College, Oxford. He became lecturer at the London School of Economics in 1897, and professor of political economy in the University of London in 1907. Besides editing Adam Smith's *Lectures on Justice, Police, Revenue, and Arms* (1896), and his *Inquiry into the Nature and Causes of the Wealth of Nations* (2 vols., 1904), he is author of *Elementary Political Economy* (1888; 3d ed., 1903); *History of the Theories of Production*

and *Distribution* (1893; 2d ed., 1903); *History of Social Rates in England* (1896; 2d ed., 1912); *The Economic Outlook* (1912); *Wealth* (1914).

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to eat the bodies of their deceased parents. In isolated instances cannibalism appears to have been dictated by no other motive than that of mere savage revenge. Although cannibalism thus appears to have been originally almost a religious ceremonial, the depraved appetite sometimes grew to such an extent that in some tribes human flesh became a regular article of diet. This was especially the case in equatorial Africa, in some of the South Sea Islands, among the Tapuyan tribes of Brazil, and on the headwaters of the Amazon. The ancient Aztecs annually sacrificed thousands of human victims to their gods, the bodies being afterward eaten by the populace. Cannibal practices were until recently common among the tribes of Vancouver Island and the northwest coast of North America generally. Occasional ceremonial cannibalism was quite general among the Indians of the United States, but the only tribes which practiced it to any great extent were the Atakapa, Tonkawa, and some others of the western Gulf coast. Consult: Grimshaw, *From Figi to the Cannibal Islands* (London, 1907); Rannie, *My Adventures among South Sea Cannibals* (Philadelphia, 1912); Weeks, *Among Congo Cannibals* (London, 1913).

CANNIFF, WILLIAM (1830-1910). A Canadian author and physician, born at Thurlow, Ontario, Canada. He graduated at Victoria University and studied medicine in Toronto, New York, and London. In 1856 he passed the examination of the army medical board, serving for a time during the Crimean War in the Army Medical Department, and after his return to Canada became professor of general pathology, and subsequently of surgery, in Victoria University. He was with the Army of the Potomac during the Civil War, and at its close returned to Canada and resumed the practice of medicine. In 1867 he was a delegate to the International Medical Congress in Paris and contributed a paper on the Indians of British North America, and in the same year he assisted in the formation of the Canadian Medical Association. For many years he was on the editorial staff of the *Canadian Medical Journal*, and, besides contributions to various periodicals, he published: *Principles of Surgery* (1866); *Settlement of Upper Canada* (1869); *History of the Province of Ontario* (1872); *Canadian Nationality* (1875); *The Medical Profession in Upper Canada* (1894).

CANNING, CHARLES JOHN, EARL (1812-62). An English statesman, third son of the celebrated statesman George Canning. He was educated at Eton and Oxford and succeeded to the peerage as Viscount Canning in 1837. In 1841-46 he was Undersecretary of State for Foreign Affairs in Sir Robert Peel's ministry and in 1846 was chief commissioner of woods and forests. When Lord Aberdeen came into office (1853), he was made Postmaster-General, and in February, 1856, he became Governor-General of India. His conduct during the crisis of the Indian mutiny was described at the time by many as weak and pusillanimous, and he received the nickname of "Clemency Canning." Now, however, it is generally recognized that he displayed firmness and courage, magnanimity and impartial justice. In 1858 the government of India was transferred from the East India Company to the crown, and he became first Viceroy of India. In 1859 he was raised to an earldom. He died in London. Consult Cun-

ningham, "Earl Canning," in the *Rulers of India Series* (London, 1891).

CANNING, GEORGE (1770-1827). A distinguished British statesman and orator, born in London, April 11, 1770. His father, who died in poverty when his son was a year old, came of an ancient Bristol family, whose ill-will he incurred by marrying beneath his station. His mother earned a precarious subsistence on the stage, and married twice again, first an actor, and, after his death, a Plymouth linen draper. Through Canning's filial affection she subsequently lived in comfort and participated in his success and good fortune. When eight years of age, his uncle, Stratford Canning, a banker, provided for his education and sent him to Eton, where he soon distinguished himself. He founded a school magazine, *The Microcosm*, for the copyright of which a publisher paid him £50, an unparalleled remuneration for a schoolboy author. In 1788 he proceeded to Christ Church, Oxford; the following year he won the Chancellor's prize with his *Pilgrimage to Mecca*, and in 1790 graduated B.A. He entered Lincoln's Inn and studied law. At school and college he made influential friends, notably the Hon. Charles Jenkinson, afterward Lord Liverpool, and at his uncle's house met Fox and Sheridan, and through them Burke and other well-known men. Burke persuaded him to abandon law for a parliamentary career, and, under the ægis of Pitt, he entered Parliament as member for Newport, Isle of Wight, in 1793. In 1796 he became Undersecretary of State for Foreign Affairs, and in 1798 acquired fame as orator and statesman by his speeches for the abolition of the slave trade and against making peace with the French Directory. In debates on other important questions he supported the ministry, not only by voice but also by his pen in a satirical paper called the *Anti-Jacobin*, which, with more violence than good taste, lashed the "new philosophy" promulgated by the French Republicans. In 1800 he made a happy marriage with the wealthy heiress Joan Scott, sister to the Duchess of Portland. In 1801 Pitt resigned, and Canning joined the opposition against the Addington ministry, but excited serious and lifelong enmities by his caustic wit and criticisms. In 1804 Pitt returned to power, and Canning became Treasurer of the Navy, continuing in office until Pitt's death in 1806. Lord Grenville offered him an office in the All-the-Talents ministry, but Canning declined. In 1807 he was appointed Foreign Minister in the Portland cabinet and displayed brilliant qualifications. He originated Cathcart's secret expedition and seizure of the Danish fleet at Copenhagen, which upset Napoleon's northern confederacy. Differences, running through several years, with Lord Castlereagh culminated in 1809 and led to a duel, in which both were hit, though neither was seriously injured. In 1812 Canning's eloquence was enlisted in favor of Catholic emancipation. The same year Liverpool sent him to Parliament and repeated the honor three successive times. In 1814 he was Ambassador at Lisbon, and in 1816, on his return, became President of the Board of Control. He supported the Liverpool ministry in their repressive measures until 1820, when he resigned in consequence of the governmental action against Queen Caroline. He was on the eve of departure for India as Governor-General in 1822, when the suicide of his former antagonist Castlereagh called him to the

head of foreign affairs. In this capacity he infused a more liberal spirit into the cabinet, asserted the independence of British politics against entanglement with the Holy Alliance, and gave new direction and impetus to commerce by a gradual suspension of the prohibitive system. He arranged the relations of Brazil and Portugal, drew the French cabinet into agreement with the British respecting Spanish-American affairs, and was the first to recognize the free states of Spanish America, when he pronounced his famous dictum that "the New World had been called into existence to redress the balance of the Old, and would in time outweigh and topple over the fabrics of kingcraft, upon which so many wise men had labored for thousands of years." He promoted the treaty combining England, France, and Russia for the settlement of the affairs of Greece; protected Portugal from Spanish invasion and, among other important home measures, prepared the way for the repeal of the corn laws. In February, 1827, paralysis attacked his old friend the Earl of Liverpool, and Canning was called upon to form a new administration. His health, however, succumbed to the cares of office, and he died at Chiswick on August 8. He was buried in Westminster Abbey, near Pitt. Consult: *Canning's Speeches*, ed. by Therry (6 vols., 2d ed., London, 1830); Stapleton, *Political Life of Canning* (London, 1831); Stapleton, *George Canning and his Times* (London, 1859); Lord Dalling, *Historical Characters* (London, 1867); Temperley, *Life of Canning* (London, 1905); Marriott, *George Canning and his Times* (London, 1905); Bagot, *George Canning and his Friends* (London, 1909).

CANNING, SIR SAMUEL (1823-1908). An English telegraphic engineer, born in Wiltshire. He was a pioneer in the manufacture and submersion of cables for submarine telegraphy, was engineer in chief of the Atlantic-cable expeditions of 1865-66 and 1869, and laid lines from England to Malta, Alexandria, and Gibraltar.

CANNING, SIR STRATFORD. See STRATFORD DE REDCLIFFE, VISCOUNT.

CANNING INDUSTRY. See FOOD, PRESERVATION OF.

CANNIZZARO, kăn'ně-tsă'rô, STANISLAO (1826-1910). A celebrated Italian chemist. He was born in Palermo and studied medicine and chemistry in his native city and later in Pisa. He took part in the Sicilian revolution in 1848 and escaped to France in the following year. In 1851 he became professor of chemistry at Alexandria, in 1855 at Geneva, in 1861 at Palermo, and in 1871 at the University of Rome. In this latter year he was also made a senator. In 1891 he received the Copley medal of the Royal Society of London. Cannizzaro was one of the ablest defenders of Gerhardt's views, and the introduction of Avogadro's rule into science is due almost entirely to the clearness with which he grasped the distinction between atomic and molecular weights. His work has thus given a powerful impulse to the development of modern chemistry. Among his minor contributions may be mentioned the discovery of benzyl alcohol and of cyanamide. Ostwald's series of *Klassiker der exakten Wissenschaften* includes Cannizzaro's *Abriß eines Lehrganges der theoretischen Chemie* (Leipzig, 1891; first published in 1858). See also CHEMISTRY; AVOGADRO'S RULE; ATOMIC WEIGHTS; MOLECULES—MOLECULAR WEIGHTS.

CAN'NOCK. An important coal-mining and

iron-manufacturing town in Staffordshire, England, situated in the ancient royal forest of Can-nock Chase, 7½ miles northwest of Walsall (Map: England, D 4). Pop., 1891, 20,600; 1901, 24,000; 1911, 28,586.

CANNON (Fr. *canon*, gun, from ML. *canon*, tube, Lat. *canna*, reed; confused with Gk. *kanōn*, *kanōn*, straight rod, rule). Artillery weapons not capable of being carried and fired in the hands, from which projectiles are thrown by the expansive force of gases, produced by the combustion of an explosive. They are either smoothbore or rifled. The former class of cannon, which are now obsolete, were used to fire spherical projectiles, while from the latter oblong projectiles are discharged. Cannon may be divided into three classes: first, guns, or those cannon in which the length of the bore is relatively great in comparison to the calibre; second, mortars, or those cannon in which the length of the bore is relatively small in comparison with the calibre; third, howitzers, or those cannon whose relative length and calibre place them between the other two classes. Modern military usage prefers the word "gun" as the generic term to include howitzers and mortars as well as all types of guns. The word "cannon" has thus gradually become obsolete in technical military literature. They may also be classified according to their use into mountain or pack artillery, field artillery, heavy field artillery, siege or fortress artillery, and seacoast artillery—a classification which is observed in this ENCYCLOPEDIA. Modern guns may also be classified according to the kind of ammunition used. Usually calibres up to and including the 4.7-inch gun use "fixed ammunition," in which a metallic cartridge case, containing the powder charge and primer, is permanently attached to the fused projectile, the whole forming a "round" of ammunition. Calibres above 4.7 inches use "separate loading ammunition," in which the powder charge is contained in a cartridge bag or in a metal cartridge case which is loaded separately after the projectile has been seated in the gun. The former group is subdivided into machine guns, revolving cannon, and rapid-fire guns. As to construction, cannon are divided into those made of a single piece and those built up of two or more pieces, as is now usually the case. Built-up cannon are either composed of steel forgings, having a tube extending through the length of the bore, with superposed concentric hoops, or a tube with the remainder of the wall composed entirely or in part of a rectangular, circular, or ribbon form of wire. Service cannon in the United States, excepting machine guns, are generally of the built-up, forged-steel type. See ORDNANCE; ARTILLERY; COAST ARTILLERY; FIELD ARTILLERY; HEAVY FIELD ARTILLERY; GUNS, NAVAL; HOWITZER; MACHINE GUN; RAPID-FIRE GUN; and SIEGE GUN for descriptions and illustrations of various forms of cannon.

CANNON, ANNIE JUMP (1863-). An American astronomer, born at Dover, Del. She was educated at Wellesley College, and became an assistant in Harvard College Observatory in 1897 and curator of astronomical photographs in 1911. Besides completing a bibliography of variable stars with 45,000 references, she discovered in her photographic work 150 variable stars, 3 new stars, and one spectroscopic binary. Her publications include: *Second Catalogue of Variable Stars* (1907); *Maxima and Minima of*

Variable Stars of Long Period (1909); *William-ina Paton Fleming* (1911).

CANNON, FRANK JENNE (1859-). An American legislator, born at Salt Lake City, Utah, a son of George Quale Cannon (q.v.), a leader in the Mormon church. He graduated from the University of Utah in 1878 and in the same year engaged in the printing business, acquiring interests also in mining enterprises in Utah and elsewhere. He was a delegate to the Republican National Convention in 1892 and 1896, and a delegate to Congress from the Territory of Utah in 1895. In the following year, against the wishes of the Mormon leaders, he became candidate for and was elected to the United States Senate, serving until 1899. As a result of political differences, he separated himself from the Mormon church and, joining the Democratic party in 1900, was State chairman from 1902 to 1904. He became managing editor of the *Rocky Mountain News* and contributed articles on political subjects to magazines. He wrote *Under the Prophet in Utah*, with Harvey J. O'Higgins (1911), and *Brigham Young and the Mormon Empire* (1913). Both these books were written as exposés of conditions in Utah under the Mormon domination.

CANNON, GEORGE QUALE (1827-1901). An American leader of the Latter-Day Saints. He was born in Liverpool, England, was early converted to Mormonism, and came to Nauvoo, Ill., about 1844. He was one of the first settlers in Salt Lake City, was sent on a mission to Hawaii in 1850, translated the *Book of Mormon* into Hawaiian, and after his return, in 1854, edited successively the *Western Standard* and the *Deseret News*. He was sent to Washington with W. H. Hooper in 1862 to urge the admission of Utah as a State, was in charge of the Mormon mission in England from 1862 to 1864, and from 1872 until 1881 was the Territorial delegate of Utah to Congress, where he was seated only after a long fight against him on the ground that he was a polygamist. He held various positions of importance in the church, including that of first councilor after 1880, was a member of the Legislative Council of Utah in 1865, 1866, 1869, 1870, 1871, and 1872, and wrote a number of pamphlets in support of Mormonism, and a biography of Joseph Smith (1888).

CANNON, HENRY WHITE (1850-). An American banker, born at Delhi, N. Y., brother of James Graham Cannon (q.v.). After working as a clerk and teller in the First National Bank at Delhi, he moved to St. Paul, Minn., where he became teller in the Second National Bank in 1870. From 1884 to 1886 he was United States Comptroller of the Currency, and from 1886 to 1904 president of the Chase National Bank. In 1911 he became president and chairman of the board of directors of the Pacific Coast Company. In 1892 he was a delegate to the International Monetary Conference at Brussels. His lecture delivered at Harvard on *The National Banking System* was published in 1910.

CANNON, JAMES GRAHAM (1858-1916). An American banker, born at Delhi, N. Y., brother of Henry White Cannon (q.v.). He became president and director of the Fourth National Bank of New York, and also director in many other banks and in important corporations. He published *Clearing Houses: Their History, Methods, and Administration* (1908), and an address, *Clearing Houses and Currency* (1913).

CANNON, JOSEPH GURNEY (1836-1926). An American lawyer and congressman, born at Guilford, N. C. From 1861 to 1868 he was State's attorney in Vermilion Co., Ill., and from 1873 to 1891 served as a Republican in the Federal House of Representatives. He held the same office from 1893 to 1903. In 1890, with Reed and McKinley, he drew up the "Reed rules" of the House. He was chairman of the Committee on Appropriations in the Fifty-fifth and Fifty-sixth Congresses, and was elected Speaker of the Fifty-ninth (1905) and many succeeding Congresses. His autocratic power was greatly limited by the House resolution of March 19, 1910, enlarging the Committee on Rules and taking its appointment from the Speaker and giving it to the House. In 1911 Champ Clark, Democrat, succeeded him as Speaker, and in November, 1912, he failed of reelection as Representative. He was a leader of the "stand-pat" or reactionary branch of the Republican party, to whose methods the downfall of the party in 1912 was generally attributed. He was somewhat quizzically known throughout the country as "Uncle Joe" Cannon. See UNITED STATES, *History* (Administrations of McKinley, Roosevelt, and Taft).

CANNON, WILLIAM AUSTIN (1870-). An American botanist, born at Washington, Mich. He was educated at the University of Michigan and at Columbia University. He became resident investigator in 1903-05 of the Desert Laboratory, staff member in 1905 and acting director in 1911-12 of the department of botanical research of the Carnegie Institution. His publications include: *Studies in Plant Hybrids* (1903); *Studies in Heredity as Illustrated by the Trichomes of Species and Hybrids of Juglans, Enothera, Papaver, and Solanum* (1909); *Root Habits of Desert Plants* (1911); *Botanical Features of the Algerian Sahara* (1913).

CANNSTATT, or **KANNSTATT**, kân'shtát. Formerly a town of the Kingdom of Württemberg. In 1905 it was incorporated with Stuttgart, the capital. It is beautifully situated on both sides of the Neckar, which is crossed by three bridges (Map: Germany, C 4). The newer portion of the town is well built, with handsome streets and pleasant recreation grounds. It is chiefly notable on account of its saline and chalybeate springs. Overlooking the Neckar, near by, is the castle of Wilhelm, built in 1851. Of late years Cannstatt has entered to a considerable extent into industrial pursuits, and has railway shops and flourishing manufactures of machinery, cooking utensils, woolen goods, furniture, electrical supplies, etc. It owes its origin to the Romans, who founded baths here in the eighth century. It suffered much during the Thirty Years' War and through the repeated invasions of the French. It was the scene of the victory of the French under Moreau over the Austrians under Archduke Charles, July 21, 1796. Pop., 1890, 19,800; 1900, 26,500; 1905, 26,497. Consult Beck, *Cannstatt and the New Neckar-Bridge* (Cannstatt, 1893).

CANO, kân'ô, ALONSO (1601-67). A Spanish painter, sculptor, and architect. He was born in Granada, but came early to Seville, where he studied sculpture under Montañes and painting under Pacheco. In 1637, in consequence of a duel, he fled to Madrid, where, through the influence of Velasquez, he was appointed court painter. In 1644, suspected of the murder of

his wife, he fled from Madrid, taking refuge at Valencia, for his talents found him protectors, and later in the Carthusian convent, Porta Cœli. Returning to Madrid, he proved his innocence on the rack. In 1651, at his own request, he was made a canon of Granada, where he resided until his death. His earliest years were devoted chiefly to the cathedral of Granada, of which he was named chief architect. He designed its characteristic façade—his architectural masterpiece. For the Capilla Mayor of the cathedral he carved statuettes of the Virgin, busts of Adam and Eve, and painted a cycle of pictures, "The Seven Joys of the Virgin," all of which are among his best works. Because of the versatility of his talents and the high character of his work, Cano has been frequently called the Spanish Michelangelo. His painting is characterized by extreme simplification of means and by careful design, as is witnessed by his admirable pen-and-ink studies, but his color is eclectic, like that of the Bolognese. Since the dissolution of the monasteries his numerous paintings have been much scattered. The cathedral of Granada possesses many fine examples, and there are 10 in the Prado. He is also represented at Munich, Berlin, Dresden, Paris (the Louvre), St. Petersburg, and other European cities. His sculpture, mostly of colored wood, is frankly realistic in technique, simple in pose, and intense in expression. It is still the custom in Spain to ascribe the better sculptures of the seventeenth century to him, irrespective of their real authorship. His strikingly original architecture subordinated everything to pictorial effect. Consult the article by Lafonde, in *Monatshfte für Kunstwissenschaft* (1909).

CANO, ká'nó, JUAN SEBASTIAN DEL (?-1526). A Spanish navigator, born in Guetaria. He became captain of a vessel trading with Africa and the Levant, and commanded one of the five vessels of Magellan's famous expedition. After Magellan's death (April 27, 1521) he succeeded the deposed Carabello as chief of the expedition, and, having visited the Moluccas, reached Spain with one ship in 1522, being thus the first to circumnavigate the globe. He was appointed second in command to Loaisa in another expedition of five vessels which set sail July 25, 1525. He died while cruising in the Pacific. The *Victoria*, in which he had accomplished his first voyage, was long preserved at Seville.

CANO, MELCHIOR (1509-60). A Spanish theologian. He was born at Tarazon in Spain, entered the Dominican Order at the age of 15, and was ordained priest in 1531. He was employed for years in teaching theology and gained the professorships at Alcántara (1543) and Salamanca (1546) over formidable competitors. He was a determined opponent of the newly founded Society of Jesus, objecting to its marked departures from the traditions of the older orders. Charles V sent him to the Council of Trent as theologian in 1551, and he took a prominent part in its deliberations. A year later, again on the Emperor's nomination, he was consecrated Bishop of the Canary Islands; but for some unknown reason he never took possession of his see, retiring to the monastery of Piedrahita, and spending the rest of his life in theological study and works of charity. The first edition of his epoch-making work, *De Locis Theologicis*, on the sources of theological knowledge,

appeared in Salamanca in 1563, followed by more than 30 other editions; his complete works were published in Padua in 1720. Consult Fernin Caballero, *Vida del ilustre Fray Melchior Cano* (Madrid, 1871).

CANOBUS. See CANOPUS.

CANOE, and **CANOING** (Sp. *canoa*, canoe, from Carib *canóo*). Strictly speaking, a canoe is a light boat designed to be propelled by a paddle held in the hands, without any fixed support; and in the main that is correct, although in some cases canoes have an auxiliary sail, to be used under favorable conditions; and, for modern sporting purposes, some use sails only and no paddles.

Early canoes were merely a few thin strips of wood laid across each other at various angles, tied together, and bent upward, so as to form a frame much like an umbrella frame upside down. Over that a skin was stretched and sewn. With this primitive canoe rivers and estuaries were crossed. It existed until quite recent times in America and does so to-day in the Irish and Welsh coracle.

The tree, hollowed either by nature, fire, or tools, was the second stage of evolution, and canoes of this kind are common on the African rivers to-day. Upon them the bulk of the commerce of the continent was carried until lately, and it is therefore not surprising to find specimens of them in the familiar dugout of the Southern States. The islands of the Pacific, depending upon the adjacent seas for material sustenance and having little available timber, naturally produced the first builders who made a canoe out of planks. Those in Samoa are regularly built of several pieces of wood of irregular shape, fastened together with sennit and cemented all over with gum from the bark of the breadfruit tree, to prevent their leaking. Where the South Sea Islanders had larger timber, as did the Philippine Islanders, they built from a single tree trunk, with an outrigger, and sometimes two, excepting on the canals and rivers, where the space was too narrow for them. In some of the islands two canoes were lashed together, like the catamaran (q.v.); in others, fixed outriggers extended from each side. In fact, the design and method of propelling the canoes of Polynesia are endless in variety, but all masterpieces of adaptability to the conditions of their locality and their use. Wonderful sailors, too, are the natives who in them undertake even long sea voyages, far out of the sight of land, in passing from one group of islands to another. The coasts of the mainland of Siam, Burma, and China swarm with canoes. America, too, has a great variety, from the skin-covered bones which the Eskimo paddles in the Arctic seas to the shallow canoe which the Seminole poles in the Everglades of Florida. The birch-bark canoe of the American Indians was skillfully made and relatively light, and its counterpart is still frequently used in hunting and fishing trips, but the modern cedar boat is lighter, stronger, and more easily paddled.

Modern canoeing as a sport largely owes its popularity to two men in England who built canoes capable of being either paddled or sailed and took long pleasure journeys in them—John Macgregor in the *Rob Roy* between 1860 and 1869, and Baden-Powell in the *Nautilus*. The sport rapidly spread on both sides of the Atlantic, dividing itself into two schools, sailing and paddling, and naturally into two classes of de-

signs. The Canadian (or birch-bark pattern), open and undecked, built of basswood or cedar, or even paper or canvas, was chosen by the paddling fraternity. The sailors took for their first ideas the two English boats, the *Rob Roy*, a lapstreak built of cedar strips, about 14 feet long by 26 inches broad, excellent for easy rivers and coasting, but bad for rapids and portaging, or the *Nautilus*, which was designed exclusively for sailing. American ingenuity soon busied itself with inventions, and every device which could lessen weight was adopted. Charles B. Vaux invented the stationary deck seat and tiller about 1882. Paul Butler added, four years later, the sliding seat, on which the canoeist balances away out over the side of the boat, more like an acrobat than a sailor. Then followed years of elaboration in reefing and lowering sails, and experiments with folding centreboards without number. This tendency to convert the canoe into a machine, and the consequent winning of every contest by the few men who could handle them, has been largely responsible for the lessened interest in canoe-racing contests, but as a pleasant sport and summer pastime canoeing still numbers its devotees by thousands.

In America the New York Canoe Club was founded in 1871. The American Canoe Association was formed at Lake George, N. Y., in 1880, and holds an annual meeting extending over a fortnight, the first week of which is devoted to camping out and cruising, and the second to racing. It associates the Northern (Canadian Association, with 47 clubs), the Eastern (Atlantic, with 32 clubs), the Central (with 26 clubs), and the Western. Each of these divisions holds sectional meetings, but numerous clubs exist which do not belong to any association.

In Great Britain the Royal Canoe Club was formed in 1866, and it has ever since been the principal organization, with headquarters at Kingston-on-Thames, near London. There is another, the British Canoe Association, which devotes its attention entirely to cruising.

Consult: Macgregor, *A Thousand Miles in the Rob Roy*, *The Rob Roy on the Baltic*, and *The Rob Roy on the Jordan and the Red Sea* (London, 1874); Baden-Powell, *Canoe Traveling* (London, 1871); Holding, *Watery Wanderings* (London, 1886); Field, *Canvas Canoes and How to Build Them* (New York, 1887); *Canoeing and Camping Out* (Bell's Handbooks, London, 1893); Vaux, *Canoe Handling* (New York, 1888); Henshall, *Camping and Canoeing in Florida* (Cincinnati, 1884); Neide, *The Canoe Aurora's Cruise from the Adirondacks to the Gulf* (New York, 1885); Stephens, *Canoe and Boat Building* (New York, 1891); Stanton, *Where the Sportsman Loves to Linger: A Narrative of the Most Popular Canoe Trips in Maine—the Allagash, the East and West Branches of the Penobscot* (New York, 1905); "Canoes and Canoeing," *Spalding's Athletic Library* (New York, issued annually).

CANON (OF. *canone*, Late Lat. *canonicus*, from Lat. *canon*, rule, Gk. *kanón*, *kanōn*, straight bar, rule, norm). An ecclesiastic not belonging to any of the religious orders, but living in a community under a definite rule of life. As early as the fourth century Eusebius of Vercelli (died c.371) united the clergy of his see city into such a community, and the example was followed in the fifth by St. Augustine at Hippo. There are indications of the early existence of

the institution at Tours, at Rheims, and at the Lateran in Rome; but it was not common until the end of the eighth century. Its origin is sometimes erroneously ascribed to Chrodegang, Bishop of Metz from 742 to 766; but his real service was the reduction to writing of a rule of life, which was adopted by many other bodies of canons. It was taken partly from the rule of St. Benedict (he was a Benedictine himself) and partly from the traditions of the Lateran canons. With some adaptations by the deacon Amalarius of Metz, it was confirmed by Louis le Débonnaire in the great council of Aix-la-Chapelle, in 816 or 817, as binding throughout the Frankish dominions. Under this rule the canons lived under one roof, with a common table; the regular employment of their whole time was prescribed, and a spirit of brotherhood fostered. They differed from monks in wearing no cowl and making no religious vows. The immediate head of the community, under the bishop, was in the rule of Chrodegang the archdeacon, in the constitution of Aix a provost, or in some churches an abbot.

The early fervor gradually decayed and disorders crept in, partly owing to the possession of private property and the growing wealth of certain chapters, and partly to the troubled condition of Europe in the decline of the Carolingian monarchy. Vigorous reforms were attempted, in harmony with the spirit of the time, in the eleventh century, notably by St. Peter Damian and by Roman synods under Nicholas II (1059) and Alexander II (1063). These councils not only laid down strict rules for the maintenance of a common life, but strongly urged the abandonment of private property. This counsel was soon followed in many places. As the newer organizations were largely based upon the example and writings of St. Augustine, his name was generally attached to their rule, perhaps first by Gervasius, Archbishop of Rheims, in 1067. (See **AUGUSTINIANS**.) At first, and even after there were as many as 4000 houses of the kind, they had no connection with each other; but in 1339 Benedict XII established a system of general and provincial chapters, whose decisions were to be binding on all houses under their jurisdiction. In spite of this, a century later these ties had been much relaxed and the spirit of poverty forgotten. No further attempt was made at general reformation, although various separate societies succeeded brilliantly in restoring the old standards. Many of the old foundations were destroyed at the Reformation, and many more by the revolutionary developments from the end of the eighteenth century, so that only a few congregations now exist. Of these the principal ones are Lateran canons, who possess a few houses in Austria, including Klosterneuburg, near Vienna (founded 1106), and the Premonstratensians (q.v.).

In modern times the title of canon is applied to the dignitaries, whether in the Roman Catholic church or in the Church of England, who form a sort of council to the bishop and perform certain duties in his cathedral church. For their organization, see more particularly **CHAPTER**.

CANON (Lat., from Gk. *kanón*, *kanōn*, straight bar, rule, norm). A particular form of part-music based on strictest imitation. The opening theme or melody, the *antecedent*, is repeated by the other part or parts, and is then called the *consequent*. There is severe observance of the in-

tervals of the melodic design, each part "coming in" after exactly the same number of measures or bars as the second part comes in after the beginning of the theme by the first part. In



this example the second voice imitates the theme in the interval of the fifth, the third voice in the interval of the second. But the imitation may occur in any interval. Nor is there any restriction regarding the number of voices. The imitation may also be given in augmentation (q.v.) or diminution (q.v.) or in inversion, so that the consequent appears in contrary motion to the antecedent. Some canons are written so that the imitation gives the theme read backwards. In fact, no other musical form lends itself so readily to mere mechanical trickery. It is safe to say that the complexity of a canon and its value as real music stand in the relation of inverse proportion to each other. This excess of contrapuntal trickery brought about the downfall of the famous school of the Netherlands (q.v. under MUSIC, SCHOOLS OF COMPOSITION). For details the reader may be referred to the excellent work of S. Jadassohn, *Die Lehre vom Canon und von der Fuge* (Leipzig, 1884), translated into English by G. Wolff. Other treatises are those of E. F. Richter, S. W. Dehn, and J. C. Lobe (in German) and E. E. Ayres, H. A. Clarke, and E. Prout (in English). Consult O. Klauwell, *Der Canon in seiner geschichtlichen Entwicklung* (Leipzig, 1876).

CAÑON, kăn'yon; *Sp. pron.* kâ-nyôn', or **CAN-YON** (*Sp. cañon, caña*, tube, funnel, cannon). A term applied in the United States to a deep and extensive ravine along a watercourse. Cañons are formed by the erosive action of rivers on their beds and are usually limited to the upper portions of basins, where the water flows with considerable velocity and thus tends to deepen rather than widen its channel. They are typical of dry climates and of plateau regions which have been elevated in comparatively recent geological times. In moist climates rock decomposition and denudation keep pace with erosion, and the combined action of these agencies leads to the carving out of broad, open valleys, a result which may be produced after a very long period in a dry climate. But, unless the slope of the river bed has been greatly reduced, the erosive action of the water in regions of small rainfall will be more effective than the atmospheric agencies, and consequently the walls of the channel will have a precipitous

character. The nature of the rock over which the river flows is also a factor in the formation of cañons; hard rocks usually decompose slowly and thus preserve the contours of the channel as originally determined by erosion. There are many cañons in the western part of the United States, the most notable being the Grand Cañon of the Colorado, which is more than 300 miles long and has almost vertical walls rising by successive steps from 3000 to 7000 feet in height. The Rio Grande and Yellowstone have similar but less extensive cañons. The name is sometimes applied in the Western States to the narrow and deep channel of a river, by which the latter crosses a mountainous barrier, but in such instances it does not differ from a gorge. See RIVER; COLORADO RIVER; YELLOWSTONE NATIONAL PARK; ETC.

CANON, kâ'nôn, JOHANN (properly JOHANN VON STRASCHIRIPKA) (1829-85). An Austrian historical, genre, and portrait painter. He was born in Vienna, where he studied with Rahl, but learned chiefly from the old masters and closely imitated Rubens's style. After long wanderings in Europe and the East he lived for a time in Karlsruhe and Stuttgart, and finally settled in Vienna, where his energetic personality soon gained for him a position of importance. He is perhaps most effective as a painter of portraits. Among the best are those of Frau Friedländer (1874), Count Eduard Ziehy, Prince of Schwarzenberg—all in Vienna. His other works include "Cromwell," "The Johannes Lodge" (Stuttgart), "The Flamingo Hunt," "Maternal Love." His decorative paintings, of which there are examples in Vienna, Karlsruhe, and New York, are also important. He is commemorated by a bronze monument modeled by Weyr in the City Park, Vienna. Consult his obituary in *Zeitschrift für bildende Kunst* (1886).

CANON ALEXANDRINUS (Lat.). Lists of the best Greek writers in the various fields of literature, commonly attributed to Aristophanes of Byzantium (q.v.) and Aristarchus (q.v.). The older parts of the extant lists may go back to these scholars, but the canon of the orators is as late as the Pergamene school, and indeed may have been prepared by the rhetor Cæcilius in the time of Augustus; the canon of the historians is not earlier than the second century B.C.; and the canons of the sophists, grammarians, and physicians all belong to our era. It has commonly been supposed that Aristophanes and Aristarchus selected the best authors in the several fields, and that this selection contributed to the loss of the works of other authors; but it has recently been shown by Wilamowitz-Möllendorff, *Textgeschichte der griechischen Lyriker* (Berlin, 1900), that for the lyric poets, at least, the list represents only a codification of the works of the nine poets included, which had already been selected as best by the judgment of preceding centuries. That this was the case with other parts of the canon can hardly be doubted. Three lists of the best authors have been preserved to us, which do not, however, agree in all details: (a) one first published by Montfaucon, now best edited by Usener in his *Dionysius of Halicarnassus, De Imitatione Reliquarum* (Bonn, 1889); (b) the second, first edited by Cramer, *Anecdota Græca*, IV (Oxford, 1841); (c) a third, published, with the two already named, by Kroehnert, *Canonesne Poetarum Scriptorum Artificum per Antiquitatem fuerunt* (Königsberg, 1897). Further information is

given by Dionysius of Halicarnassus in his rhetorical writings, Quintilian, bk. x. 1, 54, Velleius Paterculus, i. 10, Proclus in his *Crestomathy*, and Tzetzes, in his introduction to Lycophron's *Alexandra*. The older part of the canon published by Montfaucon is as follows: *Epic Poets*.—Homer, Hesiod, Pisander, Panyasis, Antimachus. *Iambic Poets*.—Simonides, Archilochus, Hipponax. *Tragedians*.—Æschylus, Sophocles, Euripides, Ion, Archæus. *Comic Poets*.—*Old Comedy*: Epicharmus, Cratinus, Eupolis, Aristophanes, Pherecrates, Crates, Plato. *Middle Comedy*: Antiphanes, Alexis. *New Comedy*: Menander, Philippides, Diphilus, Philemon, Apollodorus. *Elegiac Poets*.—Callinus, Mimnermus, Philetas, Callimachus. *Lyric Poets*.—Alcman, Alcæus, Sappho, Stesichorus, Pindar, Bacchylides, Ibycus, Anacreon, Simonides. *Orators*.—Demosthenes, Lysias, Hyperides, Isocrates, Æschines, Lycurgus, Isæus, Antiphon, Andocides, Dinarchus. *Historians*.—Thucydides, Herodotus, Xenophon, Philistus, Theopompus, Ephorus, Anaximenes, Callisthenes, Hellenicus, Polybius. To the lists of older poets should be added the list of the Tragic Pleiades, embracing poets of the third century B.C.—Lycophron, Alexander the Ætolian, Sosiphanes, Sositheos, Dionysiades, Homer of Byzantium, Philiscus of Coreyra. The canon of the ten sophists cannot be earlier than the fifth century A.D., for it includes, besides Dio Chrysostom, Nicostratus, Polemon, Herodes Atticus, Philostratus, Aristides, the later Libanius, Themistius, Himerius, and Eunapius. Consult: Couat, *La Poésie Alexandrine* (Paris, 1882); Peterson's edition of Quintilian, bk. x, Introduction, xxviii-xxxvii (Oxford, 1891); Susemihl, *Geschichte der griechischen Litteratur in der Alexandriner-Zeit* (Leipzig, 1891-92); and the works quoted above. See ALEXANDRIAN AGE; ALEXANDRIAN LIBRARY.

CANON (kăn'yon) CITY. A city and the county seat of Fremont Co., Colo., 41 miles west by north of Pueblo, on the Arkansas River, 1 mile from the Royal Gorge and Grand Cañon, and on the Denver and Rio Grande, the Atchison, Topeka, and Santa Fe, and the Florence and Cripple Creek railroads (Map: Colorado, D 3). It is a noted health resort, situated at an elevation of 5345 feet, and surrounded on three sides by mountains, and famed for its mineral springs and its attractive scenery. It is the seat of the State penitentiary, and Odd Fellows' sanitarium and home, an academy for young women, and has a Carnegie library, two hospitals, seven public parks, and a hot-water natorium. The city has abundant water power, with an excellent gravity system, owned by the city; the soil is fertile, and in the vicinity are rich deposits of iron, coal, silver, copper, marble, limestone, and petroleum. Fruit growing is an important industry, and there are canning and brick and tile factories, a large smelter, and a reduction mill. Pop., 1890, 2825; 1900, 3775; 1910, 5162.

CANONESS. In the early Christian Church the name *κανονικά*, *canonica*, was applied to women who, living not in communities, but in their own homes, made a vow to remain unmarried and took charge of various works of charity; the name was derived from their being enrolled in the official list or *canon* of the particular church. (See DEACONESS.) In the ninth century, when the development of the canonical life became general (see CANON), communities of women living under the rule, but

not members of a religious order, were known by this name; education was their principal external function. Later, as in the case of the canons, they became differentiated into regular and secular. They mostly followed the rule of St. Augustine. The secular canonesses, especially in Germany, came to differ very little from women living in the world; their rules were few and not rigorously observed, and their houses merely safe and dignified homes for unmarried women, who were in many cases required to be of noble birth. Several such communities became Protestant at the Reformation, and still exist in Germany. For the more formal religious orders of women, see SISTERHOODS.

CAN'ONGATE, THE. A street in "Old" Edinburgh, which leads from Holyrood Palace up to the "Castle." It originally connected a distinct suburb, known as the Canongate and built in the twelfth century, with the town proper. It contains some tenements, a century or a century and a half old, which are notable for their extreme height. See Scott's *Chronicles of the Canongate*.

CANONICAL HOURS. The times fixed for divine service in the Catholic church, but no longer strictly adhered to. These have not always been the same, and it is not known when nor by whom they were settled; but they are now seven, viz., matins and lauds, prime, terce, sext, none, vespers, and compline. These used to be observed as follows: Prime, terce, sext, and none, at the first, third, sixth, and ninth hours of the day, counting from 6 in the morning; vespers at the eleventh hour; compline, or *completorium*, as completing the services of the day, at midnight; and matins shortly after midnight. The hours had mystical reference to certain occurrences in the history of the Passion of Christ. They are called canonical because according to the canon or rule of the Church. The proper offices for the canonical hours are to be found in the Breviary (q.v.). In England the term is also applied to the hours within which marriages may be lawfully celebrated. These used to be between 8 and 12 in the morning, but a recent act extended them until 3 P.M.

CANONICUS (c.1565-1647). A Narragansett Indian chief, the constant friend of the early colonists, and especially of Roger Williams, who obtained from him title to the lands that now constitute Rhode Island. He was uncle to Miantonomoh (q.v.).

CAN'ONIZA'TION. In the Roman Catholic church, the act of the Pope by which a deceased person is solemnly declared to be a saint. It had its origin in the practice in the early Church of inserting in the commemorative prayer of the liturgy the names of those who had died as martyrs or distinguished themselves as confessors of the faith. In the case of a doubtful claim to this honor, the decision at first rested with the bishop of the diocese, but was later reserved to the metropolitans. They were not seldom assisted by a council, and the question was sometimes referred to Rome. The first recorded papal canonization, however, is that of Ulrich, Bishop of Augsburg, by John XV, in 993; but no claim to exclusive right was made until Alexander III laid down in 1170 the principle which has ever since formed the basis of the law in the matter. Here and there holy men and women were revered as saints in their own neighborhoods, even after this, until Urban VIII put a stop to the practice in 1634.

Canonization, as understood in modern times, is the culmination of a lengthy process. The prospective saint must first pass through the earlier stages of being declared a "venerable servant of God," and of beatification (q.v.). The last step involves an exceedingly minute inquiry, conducted with the most elaborate legal formalities; the rules of evidence applied to the testimony in support of alleged miracles (at least two of which must be proved to have been wrought since the beatification) are more strict than in any American or English court. An ecclesiastic known as the *promotor fidei*, and sometimes as the *advocatus diaboli*, is specially appointed to urge every possible objection and test to the utmost the validity of the claims advanced. When a favorable decision is pronounced (which is never less than 50 years after the person's death), the ceremony of canonization is performed in St. Peter's with great pomp. Among the Eastern churches the principle of canonization is recognized. The right to perform the ceremony in the Greek church is vested in the Patriarch of Constantinople, but it is rarely exercised; in the Russian church the authority rests in the Holy Synod. For the rules and ceremonies of Roman Catholic canonization, consult the standard authority, Pope Benedict XIV, *De Servorum Dei Beatificatione et Beatorum Canonizatione* (Bologna, 1734-38). Consult also Boudinhon, *Les procès de béatification et de canonisation* (Paris, 1904), and Macken, *Canonization of Saints* (New York, 1910).

CANON LAW. The law of the Roman Catholic church, embodied in the *Corpus Iuris Canonici*. Its sources are the Bible, the writings of the Fathers, the canons of the councils, the decretals of the popes, the manuals of penance, custom, and secular legislation, especially in the code of Justinian. Comparatively early, attempts were made to codify the rules which governed the conduct of the Church and its members. One of the earliest attempts gave rise to the Apostolic Constitutions and Canons (q.v.). There were many other compilations at various periods which were followed by portions of the Church. (See PSEUDO-ISIDORIAN DECRETALS.) But all earlier collections were superseded by the *Decretum Gratiani*. This was compiled probably between 1139 and 1143 and published at Bologna (c.1148), and was frequently known as the *Concordantia Discordantium Canonum*. This is a general treatise composed of three parts. The first, divided into 101 *distinctiones*, subdivided into canons, treats of the sources of canon law, the organization of the Church, the ordination and the hierarchy of the clergy, the election and consecration of the bishops, the authority of the legates and primates. The second, divided into 36 *causæ*, subdivided into *quæstiones*, under which are given the pertinent canons, treats of judicial matters. The third, divided into five *distinctiones*, under which are given the canons, treats of the sacrament and the liturgy. The *Decretum* forms the first part of the *Corpus Iuris Canonici*. The second part contains four collections of decretals.

1. The *Decretals* of Gregory IX, published in 1234, which contain the important decretals issued since the publication of the *Decretum*. No name was given to the collection by Gregory; the old authors called it *Liber Extravagantium*, or *Pentateuchus*, from its division into five books.

2. The *Liber Sextus*, published by Boniface VIII in 1298, containing decretals since 1234.

3. *Constitutiones Clementinæ*, published in 1313, withdrawn for revision and reissued in 1317. These contain the decretals of Clement V and two issued by preceding popes.

4. The *Extravagantes* of John XXII (1316-1334) and the *Extravagantes Communes*. The first contains 20 decretals of John; the second 73 issued by various popes between 1298 and 1484. The *Extravagantes* were never formally promulgated and have obtained a place in the canon law only by custom. All four collections follow the traditional order of subjects, *Iudex, Iudicium, Clerus, Connubia, Crimen*. The portions of the canon law are not all of equal authority, but the distinctions are too extensive to be discussed here. (See *Bibliography* at end.) In many editions of the canon law the *Institutiones* of Lancelottus are published as a supplement. The author states that he wrote this at the request of the Pope in order to make the canon law correspond more closely to the *Corpus Iuris Civilis* (q.v.). The *Decretum* corresponds to the Pandects; the *Decretals* of Gregory IX to the Code; the *Sextus, Clementine*, and *Extravagantes* to the Novellæ; his work to the *Institutes*. It was published in 1563 and frequently since, but never approved authoritatively by the Pope. It is hardly necessary to add that, although the *Corpus* is still the authoritative collection, canon law has been constantly modified by later enactments.

During the Middle Ages the canon law was authoritative in all countries subject to the spiritual jurisdiction of Rome. The ecclesiastical courts embraced within their jurisdiction all members of the clergy and, as a privilege, widows, orphans, Crusaders, and students. But their jurisdiction extended over many other persons because they claimed the control over many cases, such as matters relative to the faith, sacraments, and vows; matters relative to marriage, ecclesiastical property, and wills; crimes against religion, or those committed in sacred places; violations of the truce of God (q.v.); the exaction of usury, i.e., interest, etc. Some of these subjects the civil authorities admitted to be wholly within the province of the ecclesiastical courts; with regard to other subjects, the civil courts claimed an equal or superior right of jurisdiction. As the royal authority became stronger in the different countries, the kings became jealous of an authority independent of their own, and attempted to bring the members of the clergy and certain classes of cases under their own jurisdiction. They were especially hostile to appeals to Rome. (See CLARENDON, CONSTITUTIONS OF.) Ultimately the royal authority triumphed, and canon law became restricted almost everywhere to purely religious and ecclesiastical questions. It is still authoritative in many countries on many subjects, and it has modified profoundly both international law and civil law in the various countries of Europe. It is impossible to state briefly, and yet accurately, its varying authority in modern times in the different countries. Until recently its importance in Germany was very great. Down to the end of the eighteenth century it was a constituent element of the common law; since that time its authority has been greatly restricted and confined in civil matters to a comparatively few states. In France it was abrogated in 1790 by the "Civil Constitution of the Clergy," and it has never regained its position. In England it has no direct authority,

but some portions of the English law are based upon canon law. In Scotland, curiously enough, when one considers Scotch history, the Roman canon law still prevails to a certain extent. Lord Stair said, in his *Institutes of the Scotch Law*, "So deep hath this canon law been rooted, that even where the Pope's authority is rejected, yet consideration must be had to these laws, not only as those by which church benefices have been erected and ordered, but as likewise containing many equitable and profitable laws, which, because of their weighty matter, and their being once received, may more fitly be retained than rejected." In two old Scotch Acts of Parliament, made in 1540 and 1551, the canon law is used in conjunction with the Roman law to denote the common law of the country, the expression used being "the common law, baith canon, civil, and statutes of the realme." In the United States some laws borrowed from the English common law are based upon the canon law.

The best edition of the *Corpus Iuris Canonici* is edited by Friedberg (2 vols., Leipzig, 1879-81). The number of good works on the canon law is very great. Tardif, *Histoire des sources du droit canonique* (Paris, 1887), gives an excellent bibliography down to that date. Consult also: Phillips, *Kirchenrecht* (7 vols., Regensburg, 1845-72, incomplete; continued by Vering, vol. viii, Regensburg, 1889); Schulte, *Geschichte der Quellen und Litteratur des canonischen Rechts von Gratian bis auf die Gegenwart* (3 vols., Stuttgart, 1875-83); Hinschius, *Das Kirchenrecht der Katholiken und Protestanten* (4 vols., Berlin, 1869-86); Maitland, *Roman Canon Law in the Church of England* (Cambridge, 1898); Taunton, *The Law of the Church* (London, 1903).

CANON OF MURATORI. See MURATORIAN FRAGMENT.

CANON OF THE BIBLE. See BIBLE.

CANON OF THE MASS. That part of the mass which contains the fixed ritual for celebrating the eucharist in the Roman Catholic church. The content and order of this ritual date from the seventh century, and the arrangement is ascribed by tradition to Pope Gregory I (590-604). It is regarded as the most sacred part of the ritual of worship.

CANONS, BOOK OF. In Scottish ecclesiastical history, a code of canons or rules for the Church of Scotland, prepared by the Scottish bishops in obedience to the command of Charles I, revised by Laud, confirmed by letters patent under the great seal May 23, 1635, and published in 1636. It tended to increase the dissatisfaction prevalent throughout Scotland, which soon broke out violently. It was considered objectionable as the work of Laud, and because it was promulgated by the King without consultation with either clergy or laity. The canons are printed in the fifth volume of the collected works of Laud, *Library of Anglo-Catholic Theology* (7 vols., Oxford, 1847-60). Consult Burton, *History of Scotland*, vol. vi (Edinburgh, 1873).

CANONSBURG. A borough in Washington Co., Pa., 18 miles southwest of Pittsburgh, on the Pittsburgh, Cincinnati, Chicago, and St. Louis Railroad (Map: Pennsylvania, A 7). It contains the Pennsylvania Training School, the buildings of Jefferson College, founded in 1802, but now part of Washington and Jefferson College (q.v.), and the original building of the Rev. Dr. John McMillan's Latin School, founded

in 1780. The borough is in a rich coal district, and its manufactures, which have grown rapidly, include pottery, tin plate, structural steel, sheet iron, stove pipes, etc. Population, including South Canonsburg, annexed in 1911, 5585; 1920, 10,632. Canonsburg was laid out by Col. John Canon in 1789 and incorporated as a borough in 1802. It was the central point of the whisky insurrection of 1794.

CANONS OF THE CHURCH OF ENGLAND. The so-called constitutions and canons ecclesiastical, agreed upon, with the King's license, in the synod held in London in 1604. They were drawn up by the convocation, in order to give effect to the decisions of the conference held at Hampton Court, and are, in the main, a digest of old canons, with some new ones added. They are 141 in number. By these canons every clergyman was obliged to swear to subscribe willingly to the royal supremacy, the Prayer Book, and the Articles. All who declared the Prayer Book or Articles to be in any way superstitious were condemned. This was a defeat for the Puritan party, but most of them took the test oath rather than go into exile. The canons are still authoritative except for the parts revised by later canons. Consult Walcott, *The Constitutions and Canons Ecclesiastical of the Church of England, etc.* (Oxford and London, 1874).

CANON'S YEOMAN'S TALE. One of the *Canterbury Tales*. It is told by an itinerant and disreputable canon's starving servant and guard, and consists of a description of the various trickeries practiced by the alchemists, of which the canon is one, upon their credulous and avaricious dupes.

CANOPIC VASES. The name given to the four vases in which the ancient Egyptians used to place the viscera taken from the dead when embalming them. The vases were mostly of stone, and the lids represented, in later times, the heads of the four genii, the so-called sons of Osiris, who protected each a special part of the intestines (stomach and large intestines; small intestines; lungs and heart; liver and gall bladder). The modern name has no authorization from the classical writers.

CANO'PUS, or CANO'BUS. A city of ancient Egypt, about 14 miles east of Alexandria, at the Canopic mouth of the Nile, which was thus called after the city. It did not become a place of importance until after the foundation of Alexandria, when the Alexandrians used the town as a pleasure resort, and it had a rather bad reputation. Canopus was an important port, and although the Canopic channel is now filled up, there are still numerous ruins of the ancient town on the shore at Aboukir. The temple of Serapis, located in this town, possessed a famous oracle, much frequented by invalids in pursuit of health. The ruins of this temple were the field of successful excavations in 1893. The Greek name seems to be an assimilation of the name of the legendary helmsman of Menelaus with some unknown Egyptian word. There seems to have been a confusion between Osiris and Canopus.

CANOPUS (Lat., from Gk. *Κάνωπος*, *Kanōpos*, a city of lower Egypt). The principal star in the constellation of the ship *Argo*. According to the *Harvard Photometry*, it is the second most brilliant star in the heavens, being surpassed by Sirius alone. It is one of the few brilliant stars for which no sensible parallax has been found, indicating that it must lie at

a distance of at least 300 light years from the earth. According to Plutarch, it received its name from Canopus, the pilot of Menelaus.

CANOPY (Fr. *canapé*, It. *canope*, ML. *canopium*, gauze net, Gk. *κωνοπέιον*, *kōnōpeion*, perhaps from *kōnos*, *kōnos*, cone + *ὤψ*, *ōps*, face). Originally, in classic literature, a tentlike mosquito netting (Herodotus, ii, 95; Horace, *Epistles*, ix, 9); hence any fixed hanging or projection over a bed, couch, or throne, or similar portable object carried over dignitaries in processions, as the baldachin (q.v.). The term has since passed into architectural terminology to designate also any overhanging covering or projection above an altar, tomb, or statue, whether

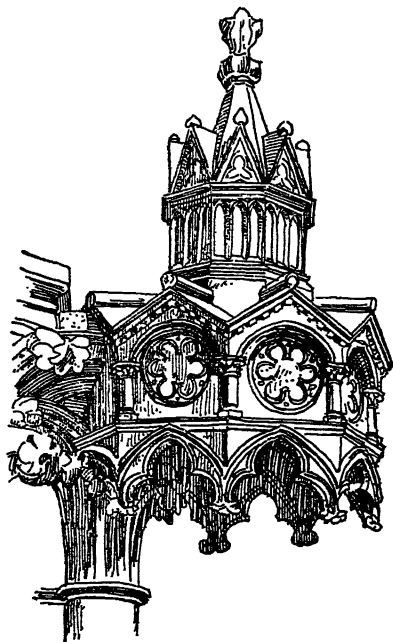
pulpits, tombs, wells, fonts, and doors in various countries; among examples of these may be cited an early Renaissance font canopy at Bretnagolles, France; the canopy over St. Sebald's tomb in Nuremberg, and the carved wood canopies over many seventeenth-century pulpits in Belgium. Under Louis XIV and Napoleon I in France superb canopies of brocaded silk were placed over the royal thrones and bedsteads.

CANOSA DI PUGLIA, *ká-nō'sá dē pōō'lyá* (Lat. *Canusium*). A city in the Province of Bari delle Puglie, in south Italy, 15 miles southwest of Barletta, on the slope of a hill, near the Ofanto (Map: Italy, L 6). The cathedral of San Sabino, with pavement several feet below the surface of the street, was built about 1101. In an adjacent court is the tomb of Bohemond I, who died in 1111; it has bronze doors by Ruggieri of Amalfi. There is a ruined castle, built by Charles I of Naples. A gate and the ruins of a large amphitheatre and of an aqueduct testify to the prosperity of the ancient Canusium, while from the tombs in the vicinity, excavated in 1812-13, painted vases, painted busts, marble statues, and other magnificent funeral furniture have been transferred to the museum at Naples. The town was founded by the Greeks, and till the Second Punic War was an important commercial centre. Near by is the battle ground of Cannæ. The country produces wine and oil. Pop. (commune), 1881, 19,000; 1901, 24,169; 1911, 26,053.

CANOSSA, *ká-nō'sá*. A ruined castle in north Italy, 12 miles southwest of Reggio, celebrated as the place where, in 1077, Emperor Henry IV obtained absolution from Pope Gregory VII after three days' humiliation (Map: Italy, E 3). Hence the expression "Go to Canossa" is proverbially used to denote a surrender to the claims of the Church. When Bismarck inaugurated his Kulturkampf (q.v.), he publicly boasted that he would never "go to Canossa," but he did. The ivy-clad ruins of the castle of Canossa, which in the eleventh century belonged to Countess Matilda of Tuscany, Gregory's friend, and which was destroyed by the citizens of Reggio in 1255, crown the rock above the little village. From it there is a splendid view to the south of the castle of Rossena, with the Apennines in the background, and to the north, of the valley of the Po.

CANOT, *ká'nō'*, THEODORE (1807-50). An African slave trader. He was born in Florence, Italy, son of a French soldier, and after numerous adventures on American ships made his first voyage to Africa in 1826, sailing from Havana to Bangalang, on the river Pongo, Senegambia. After several successful voyages as the owner of a slave transport, he established a slave station at Kambia, which was destroyed by fire in May, 1828. Afterward he became the pioneer of the slave traffic at New Sestos, and in 1840 sent 749 slaves from that station to Cuba. Upon the destruction in 1847 of the settlement of New Florence, which he had established several years previously, ostensibly as an agricultural and trading centre, he removed to South America, whence he went to Baltimore, Md., and finally to France, where he was appointed an official in one of the French colonies of Oceania. Consult Mayer, *Captain Canot, or Twenty Years of an African Slaver* (New York, 1854).

CANOVA, *ká-nō'vā*, ANTONIO (1757-1822). An eminent Italian sculptor, the founder of the



CANOPY.

(After Viollet-le-Duc.)

made of wood, stone, or metal—such a canopy as was termed "ciborium" in the Middle Ages.

In Gothic architecture canopies of considerable architectural richness, with cusped arches, gables, and pyramidal roofs were common over tombs, both in Italy (e.g., tombs of the Scaligers in Verona) and western Europe; and in Italy they were often placed over the high altar, supported on four columns. (See *CIBORIUM*.) This practice lasted from Byzantine times (Ravenna) to the late Renaissance (St. Peter's, Rome). In the middle and late Gothic of western Europe it became increasingly the practice to set over each niche containing a statue, and over each seat or stall in the choir of a church, an elaborately carved, spirelike canopy. In the fifteenth and sixteenth centuries such canopy work reached the acme of minute elaboration and complexity, forming one of the most prominent decorative features of the style not only in France, but throughout Europe. The canopy was much used in miniature form, in reliquaries, shrines, and other goldsmith work, and in works of industrial art, tapestries, stained glass, etc. Canopies occur less frequently in the Renaissance, but they are found over altars in Italy, over

modern classic school. He was born at Possagno in the Province of Treviso, Nov. 1, 1757. His family had been stonecutters for generations, and his grandfather taught him the use of the chisel. The lad's talent attracted the attention of the Venetian Senator Giovanni Falieri, who procured him admission, in his fourteenth year, to the atelier of the sculptor Torretti, who was working in the neighborhood. Canova accompanied the latter to Venice, and after Torretti's death he studied with his nephew Ferrari. He also attended the Venetian Academy of Art, studying especially the nude; but found little to inspire him in the debased Rococo of the day. His progress was rapid, and at the age of 15 he executed for his patron Falieri two statues, "Orpheus" and "Eurydice." His "Dædalus and Icarus," executed in his twenty-second year, and now in the Venetian Academy, was even more famous. While still in the Baroque style, these works show originality, and a careful study of the nude. In 1779, through the influence of Falieri, he received a pension from the Venetian government, entitling him to three years' study in Rome.

He arrived there at a time when the life work of Winckelmann (q.v.) and others was bearing fruit in a new enthusiasm for classical antiquity. Through the influence of the Venetian ambassador he was introduced into literary and artistic circles, where he formed his lifelong friendship with Quatremère de Quincy (q.v.), the celebrated French archaeologist and critic, who exercised great influence upon his art. He threw himself with ardor into the study of the antique, and his "Theseus Vanquishing the Minotaur" showed the fruit of these studies. Exhibited in 1782, it was epoch-making in modern sculpture, as a return from Baroque to classic art. He at once rose to the rank of the first sculptor of his day. A commission for a monument to Pope Clement XIV, in Santi Apostoli, was assigned to him, and on the successful completion of this work, in 1787, he received a commission for a like monument to Pope Clement XIII, Rezzonico, in St. Peter's, completed in 1795—one of his best works. Upon the sarcophagus is a statue of the Pope kneeling in prayer, while on the left is a rather stiff figure of "Religion," with the cross, and on the right a genius, somewhat effeminate, with the torch of life reversed. Beneath are two splendid lions, the best part of his work.

During this period Canova also executed works of quite a different kind. His famous "Cupid and Psyche" (Louvre), in which the love god, bending over, raises Psyche from the earth, although not without charm, marks what might be called a departure from the antique, because of the constrained position. More attractive is his later representation of the same subject in the Louvre, where Cupid leans confidently on Psyche's shoulder, watching a butterfly. Among his other famous works executed before 1798 are his "Venus and Adonis," in the Naples Museum, celebrated for the caressing attitude of the goddess and "Hebe Pouring Nectar" (Berlin), a charming specimen of girlish beauty, and different representations of the same subject in the Royal Palace, Munich. He usually executed several replicas of works like these, and those cited are either the original or, failing these, the best-known copy.

In order to show his ability with more virile subjects he carved colossal figures of "Hercules

Throwing Lichas into the Sea," now in Palazzo Torlonia, Rome, and of the two Greek boxers, "Creugas and Damoxenos," in the Vatican. Although deemed successful by contemporaries, the exaggerated action of these statues displeases modern critics, notwithstanding the great anatomical knowledge displayed, especially in the inverted figure of Lichas.

While the Pope was expelled from Rome in the revolution of 1798, Canova spent two years traveling in Austria and Germany with Prince Rezzonico. He returned, however, with the new Pope, and soon afterward executed his "Perseus," which was purchased by the Pope, with general applause, and placed upon the empty pedestal of the "Apollo Belvedere," after which it had been modeled, in the Vatican. In 1805 the sculptor was commissioned to execute a substitute for the "Medicean Venus," which, like the Apollo, had been taken to Paris by Napoleon. His "Venus" now stands in the Pitti Palace. The "Three Graces" (St. Petersburg) were executed in rivalry to the antique subject in Siena. Compared with the antique these works seem lacking in simplicity and sentiment; they appear artificial and sentimental, like the age of Canova. Herein lies the importance of Canova as the characteristic representative of his time. His art is a transition from the Baroque to the purer classical taste of Thorvaldsen and his successors, and his position in the development of modern sculpture is like that of David in painting. He was the first to show the way to what became one of the most important factors in modern sculpture.

Canova was three times summoned to Paris by Napoleon, in 1802, 1805, and 1810. His patriotism would not permit him to accept the Emperor's brilliant inducements to remain in Paris. He pleaded with success for the support of the arts in Italy, but could not induce the Emperor to return the extorted art treasures. He carved the well-known ideal bust of Napoleon in the Pitti Palace, and in 1812 he finished a colossal marble statue, in which, according to Roman custom, the Emperor is represented nude, as a god. The original marble is lost, but an excellent bronze cast is in the court of the Brera Palace, Milan. He also represented Napoleon's sister, Pauline Borghese, as a reclining Venus, his mother as Agrippina, the Empress Maria Louisa as Concordia. In 1815, after the fall of Napoleon, he was sent as the Pope's ambassador to Paris, to bring about the return of the art treasures taken from Rome, and it was largely owing to his skill as a diplomat that they were returned. On his return to Rome the Pope made him Marquis of Ischia, the Academy of St. Luke chose him perpetual president, and the Roman Senate inscribed his name in the Golden Book of the Capitol. During his embassy to Paris he visited London and saw the Elgin marbles, but warmly rejected Lord Elgin's proposal to restore them.

One of Canova's most celebrated works was the monument ordered, in 1798, by Albert, Prince of Sachsen-Teschen, for his wife, Marie Christina, Archduchess of Austria, but not completed till 1805, and erected in the church of the Augustines in Vienna. It consists of a marble pyramid, in front of which are two groups of figures. On the left "Virtue," attended by two beautiful maidens, and bearing the cinerary urn, strides towards the door of the pyramid, followed by "Charity," leading a blind old man.

On the right recline a lion as guardian of the tomb, and a mourning genius. The composition is more adapted to a painting or relief than to a work of sculpture, and the figures, notwithstanding their beauty, have the effect of artificiality. Among his other sepulchral monuments are that of his friend Volpato, in Santi Apostoli, Rome; of the poet Alfieri, in Santa Croce, Florence; of the last three Stuarts, in St. Peter's, Rome, and of Pius VI, a praying figure, in St. Peter's. In these works he appears at his best. Among his classical subjects are an excellent "Paris" (1807) in Munich, "Theseus and the Centaur," in Vienna, and a "Mars and Venus" in London. His famous series of antique dancers are too studied in pose to be pleasing. One of the last works which may be seen in the museum in his native town was the plaster model of George Washington, clad as an antique hero, writing his last message. He seldom treated religious subjects, and when he did he represented them as beautiful, classical figures. The best-known example is a kneeling "Magdalen" in Villa Carlotta, Cadenabbia.

Canova also executed a large number of portrait busts of the celebrities of his day, his friends, and especially of ideal women, as Laura or Beatrice. They are too lacking in individualization to be good portraits. He was unsuccessful in relief work, owing to his inability to make a good composition. As a painter he is of little importance. But in his proper field of sculpture he is one of the most prominent figures of modern times. No one has treated the surface of marble with more delicacy and more skill than he.

Canova died in Venice, Oct. 13, 1822, and was buried at Passagno in a church which he had himself erected at the cost of his earnings of a lifetime. There is also a monument to him, after his own design, in the church of the Frari, Venice, near the tomb of Titian. He was a man of lovable character, kind and charitable, especially to young and needy artists. He was inspired by a lofty patriotism, and by a touching love for his native town, to which he returned whenever possible. His house there contains a museum of his works, with the original plaster models of the most remarkable. His works were engraved by Lasinio (Pisa, 1821-25), Moses (London, 1828), and Reveil (Paris, 1825).

Bibliography. Canova's memoirs were edited by D'Este (Florence, 1864), his letters by Malaman (Città di Castello, 1890). An excellent contemporary biography of him was written by his friend, Quatremère de Quincy (Paris, 1834), with which compare the more critical *Römische Studien*, by Fernow (Zürich, 1806). Other biographies are those of his friend Cicognara (Venice, 1823); Missirini (Prato, 1827); Rosini (Pisa, 1825); Lücke, in Dohme, *Kunst und Künstler des neunzehnten Jahrhunderts* (Leipzig, 1883); Meyer, in Knackfuss, *Künstlermonographien* (Bielefeld, 1898); and Malamani (Milan, 1911), the best and most detailed account.

CÁNOVAS DEL CASTILLO, ká'nò-vás dél ká-sté'lyò, ANTONIO (1828-97). A Spanish statesman, born in Málaga, June 5, 1828. He studied philosophy and law in Madrid, entered journalism, and soon became active in politics. In 1852 he represented his native city in the Cortes as a Liberal, and two years later was appointed chargé d'affaires at Rome, where he aided in preparing the concordat between Spain and the

holy see. After being Director General of the administration from 1858 to 1861 and Under-secretary of State in the latter year, he became, in 1864, Minister of the Interior in the Mon ministry, and Minister of Finance and the Colonies in the O'Donnell ministry the next year. He prepared at the time the law for the abolition of negro slavery. He was one of the last to defend in the Cortes the Liberal principles he espoused under the reactionary sway of Narváez and González Bravo and was banished shortly before the revolution of 1868, in which he had no share. Returning to active life in 1869, as the leader of the moderate Conservatives, he opposed in the Constituent Cortes the project of a democratic constitution and was one of the leaders of the movement which placed Alfonso XII on the throne. He became President of the Council and chief of the provisional cabinet Dec. 31, 1874, and remained at the head of the Liberal-Conservative ministry (the so-called Cabinet of Conciliation). He withdrew in September, 1875, before the attacks of the extreme Conservative party. He was recalled in December of the same year and charged with the direction of the first legislative elections under the new regulations. From this time he remained Premier until 1879, when Marshal Martínez Campos returned from Cuba and took his place, retaining the principal members of the cabinet. Martínez Campos was in turn obliged to resign in December, being defeated upon certain free-trade measures, and Cánovas returned to power. His Conservative cabinet was overthrown in 1881. He was again Premier in 1884-85, in 1890-92, and again in 1895-97, alternating in office with Sagasta, the leader of the Liberals. In time his ideas became decidedly Conservative, and to the Radical element in Spain Cánovas appeared in the light of a reactionary. He was assassinated by an anarchist, the Italian Michele Angiolillo, on Aug. 8, 1897. In the preceding April he had formulated and decreed a plan to grant autonomy to Cuba. Cánovas found time, even in the stir of Spanish political life, for considerable literary activity. In 1859 he was elected a member of the Royal Academy of History of Madrid, of which he later became director, and in 1865 he entered the Spanish Royal Academy of the Language. In 1890 he was president of the *Ateneo científico, literario y artístico* of Madrid. The *Academia matritense de jurisprudencia y legislación* in 1893 elected him "académico de mérito," the highest distinction conferred by that academy. The previous year he had been its president. Cánovas was also a member of the *Real academia de bellas artes (de San Fernando)* and of the *Real academia de ciencias morales y políticas*. Although Cánovas declined to accept a title of nobility offered to him by a grateful sovereign, he did accept knighthood in many orders. Among his writings are a volume of poems (1887), *Estudios del reinado de Felipe IV* (1888); *Artes y letras* (1887); *Problemas contemporáneos*, a collection of essays on economic and social questions (1884); *Biografía de Calderón* (2 vols., 1883); and several minor pieces. He also edited the works of a number of contemporary dramatists (2 vols., 1881-86), and an important historical work, the *Historia general de España* (10 vols., 1890-97). The most extended biography is by Pons y Humbert, *Cánovas del Castillo* (Madrid, 1901). Consult also Clarín, *Cánovas y su tiempo* (Madrid, 1887).

CANROBERT, kân'rô'bar', FRANÇOIS CEBTAIN (1809-95). A marshal of France. He was born at Saint-Céré, June 27, 1809, studied in the military school of Saint-Cyr, and in 1828 entered the army. After 1835 he served in Algeria. In the storming of Constantine he was one of the first to enter the breach. In 1849 he commanded a successful expedition against the Kabyles. As general of brigade, in 1850, he led an expedition through the rocky country of Narah and destroyed the Arab stronghold there. In January, 1853, he became a general of division. In 1854 he commanded a division in the Crimea and upon the death of Saint-Arnaud he assumed control of the French operations. In 1856 he was made marshal of France and sent to Sweden and Denmark on diplomatic missions. In 1859 he was a corps commander in the Italian campaign against Austria and took part in the battles of Magenta and Solferino. At the outbreak of the Franco-German War he was in command of the Sixth Army Corps. He was shut up in Metz with Bazaine and became a prisoner. After the war Canrobert took up political life, subsequent to his appointment to membership of the Superior Council of War. He became a member of the Senate in 1876 and was returned in 1879 and again in 1885. Consult *Martin, Le maréchal Canrobert* (Paris, 1895).

CAN'SO. A port of entry in Guysborough Co., Nova Scotia, near the cape of the same name (Map: Nova Scotia, J 3). It has important fishing interests, being the port of call for the Gloucester fishing fleet. The annual trade in fish products is valued at between \$300,000 and \$400,000. Canso is the landing place of two cables of the Western Union and five of the Commercial Cable Company. The United States is represented by a consular agent. Pop., 1901, 1,479; 1911, 1,617.

CANSO, CAPE. See CAPE CANSO.

CANSTADT, kân'shtât (from *Cannstatt*, or *Canstatt*, a city of Württemberg, now part of Stuttgart). The name applied to a long-headed type of Quaternary man in Germany, based on a fragment of skull found among relics dug up in the year 1700 by Duke Eberhard Ludwig. Consult *Mortillet, Le préhistorique* (Paris, 1900).

CANSTEIN, kân'shtîn, KARL HILDEBRAND, BARON VON (1667-1719). The founder, by his writings and by his will, of the famous Canstein Bible Institute in Halle, Germany, for the distribution of the Scriptures at the lowest rates. Consult his life by Platte (Halle, 1861).

CANTAB, or **CAN'TABRIG'IAN** (ML. *Cantabrigiensis*, from *Cantabrigia*, Cambridge). One who is either a student or a graduate of the University of Cambridge, England.

CANTABILE, kân-tâ'bê-lâ (It., singable, from Lat., *it. cantare*, to sing). In music, a term which signifies in a singing or vocal manner. When placed over a passage of music, it demands an easy, flowing execution, along with a clear-cut and well-defined delivery of the chief melody, so as to bring it distinctly out against the background of the accompaniment.

CANTA'BRI (a word of Iberian origin). Mountaineers of ancient Spain. They were of Iberian origin and lived in a district comprised in the modern provinces of Oviedo (eastern part), Santander, Vizcaya, and Guipúzcoa, on the coast of the Bay of Biscay, which derived from them its name, *Oceanus Cantabricus*. Their most important town was Iuliobriga (the Roman

form of its name). The Cantabri are described as like the Scythians and the Thracians in hardihood and martial character, sleeping on the bare earth, enduring extreme pain without a murmur, and, like most savages, leaving agricultural toil to their women. Their bravery is evinced by the fact that, though the Romans first attacked them in 150 B.C., they were finally subdued only by a 10 years' contest, begun by Augustus and concluded by Agrippa (29-19 B.C.). Tiberius afterward stationed garrisons in their towns, but some of them, retreating into their fastnesses among the mountains, preserved their independence. Some count them the ancestors of the Basque race.

CANTA'BRIA. The name anciently applied to a district of Spain, on the south coast of the Bay of Biscay, the home of the Cantabri (q.v.).

CANTA'BRIAN MOUNTAINS. A range of mountains extending for a distance of over 300 miles through northern Spain near the shores of the Bay of Biscay, from the west end of the Pyrenees to Cape Finisterre (Map: Spain, C 1). Less than 30 miles wide in the east in the Basque Provinces, the range broadens out towards the west and breaks up into a number of ranges, which, with their foothills, cover the whole northwest corner of the Iberian Peninsula; at the east the main range is less than 30 miles from the coast, but this increases to about 70 miles at the west. Extreme elevations of over 5000 feet in the eastern part increase to nearly 8800 feet near the centre (Peña de Cerredo, 2678 meters); but farther west the elevations decrease from 6000 and 7000 feet in Asturias to 3000 to 4000 feet in Galicia, and rapidly diminish towards the west coast. In general, the northern and western sides are steep, forming a bold seacoast, with promontories interrupted by short narrow sections of flat coast, but on the south and east the slope is more gradual, and the descent relatively slight to the great Castilian plateau. Different portions of the Cantabrian Mountains have local names. These mountains are very rich in coal and iron.

CANTABRIAN SEA. See BISCAY, BAY OF.

CANTABRIG'IA. See CAMBRIDGE.

CANTACUZE'NUS (Med. Gk. *Καντακούζηνος*, *Kantakouzenos*), JOHN VI (c.1292-c.1380). A Byzantine Emperor and historian, born in Constantinople. Under Andronicus III (1328-41), he had principal charge of the government, and when Andronicus died he was left Regent, the successor being John Palaeologus, then only nine years old. The Empress was suspicious and finally, during his temporary absence from Constantinople, confiscated his property and imprisoned some of his family; this was in 1341, and Cantacuzenus immediately revolted and proclaimed himself Emperor. Six years of civil war followed, in which the rivals employed foreign mercenaries and nearly ruined the Empire. In 1347 Cantacuzenus entered Constantinople and became joint Emperor with John Palaeologus, but monopolized the royal power. He governed the Empire until 1354, when John, aided by a popular revolt, overcame him. Cantacuzenus abdicated and entered a monastery, where he wrote his *Memoirs*, which cover the history of the period from 1320 to 1357 and are published in the collections of Byzantine historians. He strove during his regency and reign earnestly but unsuccessfully to preserve the Empire from further decline. One of his

daughters was married to the Sultan Orchan, the son of Othman; another to the Emperor John Palaeologus. Consult Pears, *Destruction of the Greek Empire* (London, 1903).

CANTAL, kân'tâl'. A central department of France, formed out of the southern portion of the old Province of Auvergne (Map: France, S., C 3). Area, 2217 square miles. Principal rivers are the Alagnon, Truyère, and the Lot. Pop., 1896, 234,382; 1901, 230,511; 1906, 228,690; 1911, 223,361. Almost the whole area consists of the remains of an extinct volcano, intersected by gorges and diversified by peaks, the highest of which are the Plomb de Cantal (6095 feet) and the Puy Mary (5850 feet); the general level is 3000 feet above the sea. Cattle raising is the chief industry, only about one-quarter of the department yielding arable land, the rest being covered with volcano ash. Coal exists in the northwest and near Mauriac, and marble is quarried. Capital, Aurillac.

CANTALIAN. A culture epoch in the assumed eolithic period of man. See MAN, ANTIQUITY OF.

CANTALOUPE. A variety of muskmelon (q.v.).

CANTANI, kân-tā'né, ARNOLDO (1837-93). An Italian physician, born in Hainsbach, Bohemia, and educated in Prague. In 1864 he became professor of pharmacology and toxicology in Pavia, in 1867 director of the Clinical Institute of Medicine in Milan, and in 1868 professor in Naples. His investigations were devoted chiefly to such diseases as malaria, cholera, typhoid, tuberculosis, and diabetes. His efforts in behalf of the introduction of German medical methods into Italy were especially commendable. Among his principal publications are the following: *Manuale di materia medica e terapeutica* (2 vols., 1865-77), and *Manuale di farmacologia clinica* (5 vols., 2d ed., Milan, 1885-90).

CANTATA, kân-tā'tā (It., song, from Lat., *It. cantare*, to sing). In music, the name of a vocal composition of either a sacred or a secular character, for solo voices, ensembles, and chorus, with instrumental accompaniment. The sacred cantata differs from the oratorio in that it is less subjective, the solos representing individuals from a community or a congregation. The secular cantata differs from opera in the absence of stage accessories, and in this respect the name "lyric scene" is perhaps more appropriate. In mere matter of length the cantata is usually much shorter than the opera or the oratorio.

CANTEEN (Fr. *cantine*, from It. *cantina*, cellar), MILITARY. A place of refreshment, set apart in every army post, wherever practicable, for the use of the rank and file of the troops stationed there. In the United States, the word *canteen* has been replaced officially by the term *post exchange*, an institution intended to combine the advantages of a gymnasium and reading and recreation rooms. There are also in the post exchange coöperative stores and restaurants, including lunch counters, where are sold nonintoxicants and tobacco. The primary purpose of the entire undertaking is to furnish the troops, at reasonable prices, with articles of ordinary use, wear, and consumption not supplied by the government and to afford them means of rational recreation and amusement. When the exchange is free from debt, the net profits are distributed among the various organizations stationed at the post, for the maintenance of athletic teams, improvement of

the company messes, and for other authorized necessities and amusements. Previous to 1901, when the sale of intoxicants was abolished, the canteen was permitted to sell beer and wine to the troops, the sale of spirits being, however, prohibited. This department was for the advantage of men confined by their duties to the post, or those not desiring to go outside. Strict regulations were made and enforced against possible abuses of the privilege; the beverages sold were generally the best procurable, and retailed to the soldier at the lowest possible price. As a result of public pressure, however, the sale of beer and wines was formally abolished by Act of Congress in 1901. There has been much controversy regarding this side of the post exchange, the majority of army officers being strongly in favor of the sale of beer and light wines, and the several national temperance societies as strongly against it. See POST EXCHANGE.

In England there is a canteen established in every post, barrack, and standing camp; in the latter instance each regiment stationed in the garrison or camp has its own regimental canteen, while there is in addition a separate establishment known as the garrison canteen. The canteen is divided into two parts—the wet canteen, where ale, porter, and mineral water are on sale; and the dry canteen, at which groceries may be purchased. A separate institution is installed in all permanent barracks, known as the "recreation rooms." This also is a regimental institution and generally contains pool and billiard tables, material and accommodations for the playing of cards, chess, dominoes, and similar games, for which no charge is made. There is a room in the same building set apart for library and reading room. In garrisons and standing camps there is a permanent library of considerable size, supplied with standard and current literature. British soldiers are allowed three-quarters of a pound of beef and one pound of bread per diem. This is the regular government ration; all other food is purchased by the soldier, for which an average allowance of three-pence halfpenny is deducted from his pay, the scale of pay being so arranged as to cover this deduction. The value of this system to the soldier is that it gives him so much increase of pay when away from his mess or regiment. All groceries are to be purchased from the dry canteen and are retailed to the different company messes at the lowest possible rate. Individual soldiers may also purchase foods and groceries in small quantities from the dry canteen, and cooked meals or goods from the regimental café or restaurant attached to the recreation rooms. The wet canteen is for the exclusive use of private soldiers; neither wines nor spirits are permitted to be sold, nor are men allowed to have credit with the steward, as they usually are in the dry canteen and invariably in the restaurant. A noncommissioned officer is always on duty, to maintain order and prevent the admission of men denied its privileges. Corporals have their separate canteen, and sergeants their own mess, military discipline not permitting the intermingling of the rank and file. All moneys over and above the expenses and working capital are divided among the various regimental organizations and funds.

The canteen as an article of equipment varies in the different armies. In the United States, as in most of the armies of continental Europe,

it is a metal, leather, or wooden flask or bottle, having an average capacity of two pints, in which the soldier carries his liquid refreshment on the march, in which case it is carried slung by a strap over the shoulder. In the British army such a vessel is called a water bottle, while the canteen is a combination of pan, dish, and plate, constructed of tin, covered, when not in use, with a thin leather material, and carried, on the march, strapped to the valise (knapsack), pack, or waistbelt, according to the order in which the men are equipped.

CANTEMIR, kán'tye-mér'. See KANTEMIR.

CANTERAC, kán'tá-rák', JOSÉ (c.1775-1835). A Spanish general. In 1818 he went to Peru, in command of a detachment sent to assist in quelling the revolt there. With General La Serna he fought several campaigns in Upper Peru. He was a member of the cabal which in 1821 obtained the deposition of Pezuela from the viceroyalty and the appointment of La Serna to that office. As lieutenant general and commander in chief of the Royalist forces, his splendid activities and successive victories for several years maintained the authority of Spain over the insurgents and over the whole territory known as Peru; but in August, 1824, he was utterly defeated by Bolívar at the Plain of Junin. He was subsequently in command of the reserves at the final battle of Ayacucho (Dec. 9, 1824). After his return to Spain he was appointed, on Jan. 15, 1835, captain general of New Castile. Three days later some of the troops in Madrid mutinied. Canterac presented himself alone before them in an attempt to quell the mutiny and was shot down. As a brave and efficient soldier and officer he won many decorations for gallantry under fire and was rewarded with knighthood in the orders of San Fernando and of San Hermenegildo, and the Grand Cross in that of San Fernando. He was not much in sympathy with liberal or progressive ideas, however, and the people knew it, as may be judged by the popular phrase during the lifetime of Ferdinand VII: "Who are the enemies of Liberty? Ferdinand VII, La Serna, and Canterac."

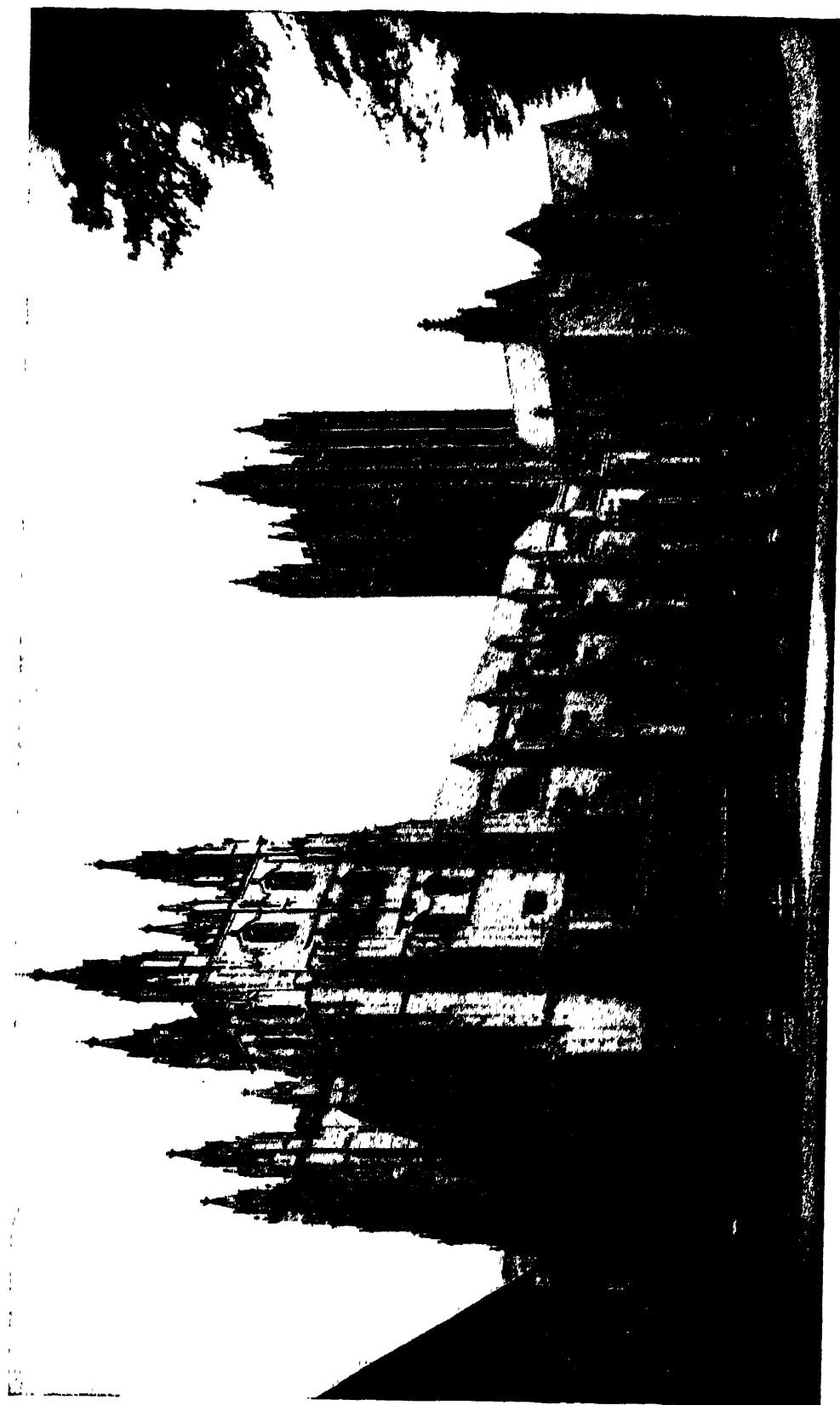
CANTERBURY, kán'tér-bér'i (AS. *Cantwara-burh*, burg of the Kents, from *Cantwara*, gen. pl. of *Cantuar*, Kentish man + *burh*, town). A municipal and parliamentary borough, civic county, and cathedral city in Kent, England, on the river Stour, 56 miles east-southeast of London, on the highroad from London to Dover (Map: England, H 5). It is the archiepiscopal see of the Primate of All England, the succession of archbishops beginning with St. Augustine in 597 and reaching the ninety-sixth incumbent of the see in Randall Thomas Davidson. The city, traversed by two main branches of the river, stands on an undulating plain between hills of moderate height. It dates from the early period of English history and retains many of the aspects of an old town, High Street containing several mediæval houses with gabled ends and projecting fronts. One of the gates and some remains of the ancient city wall still exist, and near the wall is an artificial mound, 80 feet high, known as the Dane John (probably Donjon), from the summit of which a fine view of the country around is obtained. Connected with this mound is a public garden, laid out in the end of the eighteenth century. The ruins of a Norman castle also stand near the city wall.

Christchurch Cathedral, the crowning architectural feature of Canterbury, occupies almost

the central point of the city. It stands amid its own precincts, to which admission is obtained through a beautiful gate of Perpendicular architecture erected in 1517. The cathedral is a magnificent building, 545 feet long and 156 feet broad at the eastern transepts. It presents, both externally and internally, examples of all the English mediæval styles from the Norman to the Perpendicular Gothic inclusive. The noble proportions of its nave, choir, corona, its lofty central tower, its double set of transepts, and its northwest and southwest towers are particularly impressive, as viewed from the entrance gateway.

When St. Augustine became Archbishop of Canterbury (about 600), he consecrated, under the name of Christ's Church, Queen Bertha's Church on St. Martin's Hill, which had been formerly used by Roman Christians. Upon a site a mile or so to the westward, another ancient church, replaced by a later edifice several times rebuilt or altered, was the first germ of the present edifice. The authentic history of this cathedral begins with the Norman conquest. Lanfranc, the first Norman Archbishop, erected a splendid church, of which the east end was rebuilt and enlarged by his successor, Anselm (1093), but was destroyed by fire in 1174. Its reconstruction was begun by William of Sens, and completed, with the round chapel called Becket's Crown, by William "the Englishman" after the death of William of Sens in 1178. In this new structure, comprising the choir, Trinity Chapel, and Becket's Crown, the transition to Early Gothic forms is clearly traced, with an interesting mixture of English and French details and of round and pointed arches. Lanfranc's Norman nave remained, though in a very ruinous state, intact until 1378, when, under Archbishop Sudbury and Prior Chillenden, its demolition was begun, and the present noble nave and transepts were erected, upon the old foundations, in a style foreshadowing the Perpendicular, with a richly ribbed lierne vault.

The church was rich in relics. Plegmund had brought hither the body of the martyr Blasius from Rome; there were the relics of St. Wilfred, St. Dunstan, and St. Elfege; while the murder of Thomas à Becket (q.v.) added a still more popular name to the list of martyrs. The offerings at these shrines, especially the last, contributed greatly to defray the expenses of the reconstruction under William of Sens, who did not, however, live to see its completion, dying from injuries received through a fall from the clerestory. The cathedral as reconstructed thus in the twelfth and fourteenth centuries was further embellished by the addition of the central tower (called the Angel Steeple), which was carried up (1486-1504) to about double its original height, also in the Perpendicular style; it is 234 feet high and 35 feet in diameter. The northwest tower, taken down in 1834, was replaced by the existing one to match its southwest neighbor; the old tower was 113 feet high and divided into five stories. The Norman plinth still remains on each side of the nave, in the side aisle, and portions of Norman ashlar may still be seen about the transepts outside the west wall, and on the eastern piers of the great tower. The Lady Chapel (now called the Dean's Chapel), with its beautiful fan-vaulted roof, stands on the north side of the church and was built in 1368. The northeast transept,



CANTERBURY CATHEDRAL

where Becket was murdered on Tuesday, Dec. 29, 1170, is called the Martyrdom. Fifty years later his remains were removed from the crypt to a shrine in the newly erected Trinity Chapel, eastward of the choir. About the year 1500 the yearly offerings at this shrine amounted to \$20,000; but they had then declined much in value. A mosaic pavement still remains in front of the place where the shrine stood, and the stone steps which lead up to it are worn by the knees of countless pilgrims; but during the Reformation period the shrine itself was demolished (1538) by Henry VIII's commissioners; and, according to tradition, the saint's remains were burned. In 1643 the building was further "purified," as it was called, by order of Parliament. Still many interesting monuments remain, such as the tomb of Stephen Langton; that which is commonly, but wrongly, supposed to be the tomb of Archbishop Theobald; with those of the Black Prince, of Henry IV, of various archbishops, and of Cardinal Pole. The crypt is of greater extent and loftier than any other in England, owing to the choir being raised by numerous steps at the east end. Here, in 1888, a stone coffin containing the remains of a skeleton, supposed to be Becket's, was discovered and reinterred. In 1561 a portion of this crypt was given up by Elizabeth to a congregation of French and Flemish Protestant refugees, and a French service is still held here. In 1872 the church narrowly escaped destruction for the fourth time by fire. Other buildings of the cathedral establishment include the deanery, the chapter house, the treasury, the cloisters, and the baptistery; while remains of the archiepiscopal palace, the prior's house, the dormitory, and hostleries of different grades are also seen in the precincts. Many of these were parts of the Norman monastic buildings; among them is the much admired exterior Norman stairway in the Green Court. The chapter house is of a type unusual in England; it is a stately hall, 90 by 35 feet, in Early Perpendicular style, dating from Chillenden's time.

Canterbury also contains a number of ancient churches, mostly built of rough flint, and other ecclesiastical buildings of considerable historical importance. The church of St. Martin is believed to date from pre-Saxon times, and in it King Ethelbert is said to have been baptized by St. Augustine. Near by is the Benedictine Abbey of St. Augustine, which has been restored and added to, and is now occupied as a missionary college in connection with the Anglican church. The church of St. Dunstan contains the burial vault of the Roper family, in which the head of Sir Thomas More is said to have been placed by his daughter. The secular buildings of interest are the guildhall, containing a collection of ancient arms, the corn exchange, military barracks for cavalry and infantry; the keep of the old castle, now utilized for gas works; King's School, founded, according to tradition, in the seventh century, and remodeled under Henry VIII; St. John's Hospital, founded by Archbishop Lanfranc; and, in the Chequers Inn, scanty traces of the original hostelry of the pilgrims in Chaucer's *Canterbury Tales*, the "dormitory of the hundred beds" having been destroyed by fire in 1865. Besides the two schools already mentioned, the educational institutions include the Simon Langton Schools, opened in 1882; the Clergy Orphan School, a mile outside the city; and a museum and art school.

The city carries on a considerable trade in hops and corn, has important malting and brewing establishments, and a specialty in the manufacture of brawn. The manufacture of silks, formerly a thriving industry, has been replaced by manufactures of damask linen and worsteds. The economic branch of Canterbury's history is interesting. The city returns one member to Parliament and is governed by a mayor, aldermen, and councilors. The civic spirit has always been distinguished by a combative tenaciousness for its rights and by progressiveness. The city owns real estate, markets, and electric power and lighting works, operated by the heat of a destructor, which consumes the city refuse; it provides technical instruction and maintains a museum, school of art, cemetery, and an irrigation farm, where the city sewage is deposited, chemically treated, and manufactured into manure and sold for fertilizing purposes.

Canterbury, the Roman *Durovernum*, was built on a ford of the river Stour, at the point where roads from the three fortified Roman ports—Dover, Lynne, and Richborough—joined the great Roman highway through Britain, later known as Watling Street. It subsequently became the Saxon *Cantwaraburh* ('burgh of the men of Kent'), the capital of that southeastern kingdom, and the centre from which England was Christianized. The Danes, in the ninth, tenth, and eleventh centuries, often ravaged and burned the city. After the murder and canonization of Thomas à Becket, Canterbury became of considerable importance as a place of pilgrimage. The poet Chaucer, who died in 1400, has furnished interesting contemporary accounts of these religious excursions in his *Canterbury Tales*. In 1215, during his invasion of England, Louis, Prince of France, took the castle. In 1381 Tyler's Rebellion (q.v.) originated in Canterbury. In 1538 the cathedral and other ecclesiastical institutions underwent extensive spoliation at the command of Henry VIII and later suffered from fresh exactions levied by Edward VI. During the Civil War Canterbury was the scene of exciting struggles between the Royalists and the victorious Parliamentarians, at whose hands the cathedral sustained considerable mutilation. Pop., 1901, 24,900; 1911, 24,628. Consult: Willis, *Architectural History of Canterbury Cathedral* (2 vols., London, 1845-69); Hook, *Lives of the Archbishops of Canterbury* (12 vols., ib., 1860-76); Brent, *Canterbury in the Olden Time* (ib., 1879); Jenkins, *Diocesan History of Canterbury* (ib., 1880); Stanley, *Canterbury Cathedral* (Philadelphia, 1895); White, *Canterbury Cathedral* (London, 1896); Evans and Goldney, *Canterbury* (Dover, 1899); id., "Canterbury as a Civic Centre," in *Municipal Journal*, vol. viii (London, 1899); Snow, "English History in Canterbury Cathedral," in *Canadian Magazine*, vol. xiv (Toronto, 1900). See also *Victoria History of Kent* (to be in 6 vols.; vol. i, London, n. d.).

CANTERBURY. A provincial district of about 14,040 square miles, on the east coast of South Island, New Zealand, with Christchurch (q.v.) as its capital and Lyttelton (q.v.) as its port (Map: New Zealand, C 4). Pop., 1901, 143,040; 1911 (excluding Maoris), 173,185.

CANTERBURY, THOMAS RANDALL DAVIDSON, ARCHBISHOP OF. See DAVIDSON.

CANTERBURY BELLS. A name given to *Campanula medium*, a biennial plant growing to a height of 1 to 4 feet. The stems are erect,

very leafy, and the corolla is large, bell-shaped, and inflated. A variety, *calycanthema*, which is extensively cultivated, has its calyx colored like the corolla and is commonly known as cup-and-saucer, from the shape of the flower. Double-flowered forms are common, in which several cups are formed within one another. The Canterbury bells are among the most extensively cultivated of all the campanulas (q.v.).

CANTERBURY COLLEGE. See OXFORD UNIVERSITY.

CANTERBURY TALES. See CHAUCER.

CANTHARELLUS. See FUNGI, EDIBLE.

CANTHARIDES. See BLISTER BEETLE.

CANTHARUS. A kind of vase (q.v.) used in ancient times.

CANTICLES, kân'ti-k'iz (Lat. *canticum*, little song, from *canere*, to sing. The name of the book is in Lat. *canticum canticorum*, song of songs, Gk. *ᾠδα δαδάρων*, *asma asmatōn*, Heb. *shir hashshirim*). One of the books in the Hebrew canon. There is no reference to it in the Old Testament, the Deutero-Canonical books of the Old Testament, Philo, Josephus, or the New Testament. The age of the Greek version is unknown, but it cannot well be later than the first century A.D. The book is first mentioned in the Mishna (edited about 200 A.D.). At the assembly of Jamnia (about 100 A.D.) the rabbis are said to have been of different opinion as to its canonicity, some holding that it was not a sacred book, rendering the hands unclean so that they must be washed after contact with it (see BIBLE, Canon), while others strongly maintained its religious value, among these particularly R. Akiba, *Yadayim*, iii, 5, *Eduyoth*, v, 3. This scholar denounced the men who would sing the songs of Canticles in wine houses, *Tosephta Sanh*, xii. It is evident that the allegorical as well as the literal interpretation was in vogue in the first century A.D. Probably the ascription of Canticles to Solomon, the philosopher par excellence, caused the conviction that it must have a profound significance; and the allegorical method of the day led men to find in it a description of Yahwe's love for His people Israel. This interpretation passed from the synagogue to the Church, with the modification that the bridegroom became Christ and the bride either the Church or the individual soul. Origen understood the poem very much as Akiba had, and Cocceius found in it the history of the Church down to the Synod of Dort in 1618 A.D., just as the Targumist had found the history of Israel down to the exile of 586 B.C. Some adherents of this allegorical interpretation, such as Vatablé, Bossuet, and Lowth, assumed a double sense, a description of earthly love at the same time intended to be typical of spiritual love. In defense of this view, it has been argued that the poem may have precisely the mystical sense that has been claimed for the love songs of Hafiz and Jayadeva's *GitaGovinda*. It is not altogether inconceivable that a work which has furnished so rich nourishment to Christian mysticism itself may be the product of a similar Jewish mysticism. But where the mystical tendency and the allegorical method were most in evidence, in Philo's works, there is no trace of Canticles or anything like it. At the present time there is a practical agreement among scholars that the love depicted is solely that of man and woman.

The first Christian interpreter who discarded

all allegorizing was Theodore of Mopsuestia (died 429). For this he was condemned in 551. Luther, curiously enough, looked upon Canticles as a political allegory teaching obedience to civil authority. The secular character of the poem was fully recognized by Sebastian Castalio (1544). For this offense he was driven out of Geneva by Calvin. Luis de Leon (died 1591) was incarcerated in the Inquisition five years for suggesting in his Latin translation a similar view. Hugo Grotius, somewhat cautiously, and Jean le Clerc, more decidedly, maintained that earthly love was depicted in the song. Observing what he deemed the immorality of some of the lyrics, J. D. Michaelis threw the book out of the canon, and J. S. Semler likewise questioned its canonicity. The conception of canonical authority prevalent in their time has now been generally abandoned; and the highly spiced descriptions of sexual passion have been justified, first by the supposed purpose of the author to protest against Solomon's harem life, and then by the assumption that wedded life is portrayed.

But is this poem of earthly love a drama or a mere collection of lyrics? And is the love described that of husband and wife, or of men and women who follow the promptings of passion regardless of social conventions? Already Origen says of Canticles, "Dramatis in modum mihi videtur." Cornelius a Lapide (Van den Steen, died 1637) divided the poem into five acts. Attempts at dramatic construction were made by Laurentius Petrus (1640), Hermann von der Hardt (before 1706), and an anonymous Breslau pastor (1720). Lowth (1753) regarded it as an imperfect drama lacking a regular plot. G. Wachter (1722) and J. F. Jacobi (1771) sought to indicate a plot. While the former made Solomon and the Shulamite the chief characters, the latter discovered in addition a shepherd lover. Delitzsch (1851-75) gave the classical expression to what has been called the "king theory," while the "shepherd theory" was especially developed by Velthusen (1786), Stäudlin (1792), and Ewald (1826, 1839, 1842). Through Ewald, this theory became widely accepted. Büttcher (1850) even more decidedly made the poem a modern operetta enacted on the stage. Hitzig (1855) discovered Solomon's wife, and Stickel (1888) was able to find two shepherds and two shepherdesses. The latest critic who has accepted this view is Duhm (1902). He regards Canticles as an operetta resembling the mediæval miracle plays, and divides it into 20 lyrico-dramatic passages. The plot is simple; true love wins the day over all the efforts of Solomon to part the lovers and make the maid of Sharon his favorite wife. The songs are sung partly by individuals, such as the Shulamite, Solomon, and the shepherd, partly by choruses of harem ladies, women of Zion, bridesmaids, and kinsfolk. Several objections have been urged against this theory. The ancient Hebrews possessed no theatre, and the Semitic race has produced no great dramatic genius; there is no intelligible plot in Canticles; there is a lack of verisimilitude in the King's character and behavior; there is something absurd in the idea that the heroine's answers to Solomon are in reality addresses to her absent lover; and the necessity of putting the Shulamite to sleep on the stage, to dream through entire scenes, is not less embarrassing.

Bossuet (1693) and Lowth thought that Canticles might have been written for a royal

wedding, and divided it into sections corresponding to the days of the feast. Renan (1860) made the important suggestion that it may be the libretto of a simple play performed privately at some rural wedding, where the singers took the parts of Solomon's guards, ladies of Jerusalem, and others. To this view he was led by the accounts of Schefer of such performances seen by him at Damiatta and in Syria. Similar observations made by Wetzstein in the neighborhood of Damascus caused this scholar to think that Canticles is not a drama, but a collection of wedding songs, intended to set a standard of decency and good taste for wedding poets to follow. Certain features of the Syrian wedding, such as the bridal couple playing king and queen, the sword dance of the bride, and the *wasf* or song in praise of the bride, particularly impressed him (1873). Wetzstein's view was accepted by Stade (1887), and particularly elaborated by Budde (1894-98), Siegfried (1898), and Cheyne (1899), who strongly emphasize that the poems throughout describe wedded love. This theory, though more probable than the earlier views, is not wholly free from objection. It is difficult to see how a natural exegesis can find wedded love described in scenes that present the husband *ex hypothesi* as knocking at his wife's window and being refused admittance on the ground that she is not dressed, or the heroine as roaming through the streets of the city at midnight in search of him, or expressing a wish that he were her brother that she might kiss him without being reproved. The necessity of resorting to dreams is again suspicious.

The conception of Canticles as an anthology of love songs, idyls, eclogues, or madrigals was entertained by Luis de Leon (1569), René Rapin (1659), Charles Cotin (1662-63), Richard Simon (1678), Jean le Clerc (1685), and Claude Genest (1707). It was given special prominence through Herder (1778) and was accepted by Eichborn, Goethe, De Wette, Döpke, Magnus, Diestel, and Reuss (1879), who has treated Canticles from this point of view with much delicacy and insight, calling attention especially to the poet's peculiar manner of making the woman with whom he is in love the speaker by preference. Haupt (1907) adopted this view and threw much light on the meaning of obscure phrases, but deemed it necessary to assume transpositions on so large a scale that the result is an arrangement of the material into a new series of canticles. Schmidt (1911) regards the book as a *florilegium*, or anthology, of love lyrics, some eclogues, others madrigals, some composed originally for weddings, others written by the chief poet, after the fashion of the *Anthologia Palatina*, and possibly under the influence of Meleager, and in his division of the songs into 19 canticles and metrical translation, finds no difficulty in preserving the order of the Hebrew text.

A wholly satisfactory hypothesis must recognize the element of truth in each of these theories. There is, indeed, in Canticles a use of metaphor amounting at times to allegory. He who thinks that by gardens, fountains, trees, fruits, and wine these objects in nature are always meant, will not understand the songs. There is now and then an unmistakable *double entendre*, though to seek for one in every phrase is wholly unwarranted. To convert every innocent and delicate description of natural scenery

into an allusion to things sexual is to introduce a new allegorical method scarcely to be preferred to any of its predecessors. The love of the King and of the Shulamite is unquestionably of the same character. Yet there are, beyond a doubt, rustic lovers in the poem. It seems probable that here and there the poet has used language familiar from the marriage festivals where country folk were playing king and queen, bodyguard and harem during the wedding week. The dialogue gives the impression of an attempt to create a drama, but the monologue is more characteristic of the songs; and there is no movement, no action, no plot, no unity. As already Richard Simon (1678), and after him Herder, recognized, the songs do not all come from the same source. They do not describe the love of a married couple.

It is now generally acknowledged that Solomon cannot have been the author of Canticles. The language itself, with its Neo-Hebraisms, Aramaisms, and Persian and Greek loan words, indicates with sufficient clearness that the book is one of the latest in the Hebrew canon. Graetz regarded the author as dependent upon Theocritus (third century B.C.). Cheyne also thinks of the reign of one of the earlier Ptolemies. Siegfried is willing to go into the second century. Winckler has suggested that the book was written by a Jew in Damascus in the period of the Nabataean kings. There is indeed much that points to the trans-Jordanic region and particularly to the Decapolis. It is of no small significance that it is among the Greek lyric poets of the Decapolis that we find the first impassioned expression of a sense of beauty in nature. The reign of Aretas III or Aretas IV (c.85-63 B.C.) is, perhaps, the most probable date. Together with a strong emphasis upon the divine rights of passion, the supreme value of pure attachment between man and woman, it is the keen sense of beauty in nature that will always give to Canticles a distinguished place in ancient Hebrew literature. Consult: Herder, *Das Lied der Lieder* (Berlin, 1875); Ewald, *Dichter des alten Bundes* (Göttingen, 1839); Delitzsch, *Hoheslied und Koheleth* (Leipzig, 1875); Renan, *Le cantique des cantiques* (Paris, 1860); Siegfried, *Prediger und Hoheslied* (Leipzig, 1898); Duhm in *Encyclopædia Biblica* (1899); Reuss, *Le cantique des cantiques* (1879); A. Harper, *Song of Solomon* (1902); Margoliouth, *Song of Solomon* (1902); Paul Haupt, "Book of Canticles" in *Am. Journal of Semitic Languages* (1902); id., *Biblische Liebeslieder* (1907); Scholz, *Kommentar über das Hoheslied* (1904); E. C. Martin, *Song of Songs* (1908); W. Zapletal, *Song of Solomon* (1907); J. Hontheim, *Song of Solomon* (1908); N. Schmidt, in *Messages of the Poets* (1911), where there is a very extensive bibliography.

CANTILEVER (probably Lat. *quantia libra*, of what weight, from *quanta*, abl. fem. sing. of *quantus*, how much + *libra*, weight. The word may possibly be derived from Eng. *cant*, angle, and *lever*). The part of a beam or girder which projects bracketwise beyond the point of support, as the brackets supporting a balcony or the projecting girders which carry a sidewalk outside of the trusses of a bridge. In bridges a cantilever is a girder or truss anchored to a shore abutment and resting on a second outshore pier or tower beyond which it projects. Two such cantilevers extending out from the opposite shores of a stream and united by a truss consti-

tute a cantilever bridge. For examples of such structures, see BRIDGE.

CANTILLON, RICHARD (?1680-1734). An Irish merchant and economist. Little is known of his life beyond the fact that after spending his youth in trade in London he removed to Polycon, Paris, and organized a bank. His economic contributions are contained in a work published first in 1755 in French translation, under the title *Essai sur la nature de commerce en général*. This essay exerted a deep influence upon Mirabeau, Quesnay, and Turgot, and also upon Adam Smith. Its keen analysis of the principles of production, of value, and of distribution led W. S. Jevons to the conclusion that political economy as a science originated in Cantillon.

CANTIRE, kân'tîr', or **KINTYRE**. A peninsula in Argyllshire, Scotland. 43 miles long, with an average width of $6\frac{1}{2}$ miles (Map: Scotland, C 4). It extends north and south between Arran Isle and the Atlantic, and is united at the north end with the mainland by the isthmus of Tarbet, a mile broad, across which the cutting of a canal is contemplated. The southwest point, the Mull of Kintyre, Ptolemy's *Epidium Promontorium*, is crowned by a lighthouse 297 feet above sea level, visible for a distance of 24 miles. Consult White, *Archæological Sketches in Scotland (Kintyre)* (London, 1873).

CANTON', Fr. pron. kân'tôn' (Fr., from *ML. canto, cantonum*, ultimately probably from Gk. *kanthos*, *kanthos*, felly of a wheel). A political division varying in importance in different states. In Switzerland the cantons are legislative and administrative units, analogous in position with the several commonwealths of the United States. In France the canton is a judicial district, comprising, as a general rule, a number of communes, but constituting in the case of very large cities only a part of such commune.

CANTON in heraldry is a corner of the escutcheon cut off by straight lines in the dexter or sinister chief.

CANTON' (Chinese *Kuang-chou-fu*, or *Sheng-cheng*). One of the chief commercial cities of China, capital of the Province of Kuang-tung and residence of the viceroy or Tsung-tu, so called under the Manchu government, for the two provinces of Kuang-tung and Kuang-si. It is situated on the Chu-kiang, or Pearl River, about 70 miles from the sea, in lat. $23^{\circ} 7' 10''$ N. and long. $113^{\circ} 14' 30''$ E. The climate is hot, but not unhealthful for Europeans. Canton consists of the city proper and the suburbs extending along both sides of the river. There is also a large population living in boats on the river. The city proper is about 6 miles in circumference and is encircled by a brick wall laid on granite and sandstone foundations and measuring about 30 feet in thickness and from 25 to 40 feet in height. An inner wall divides the inclosed area into the new and the old city. The streets are long, narrow, and clean in comparison with the streets in most of the Chinese cities. The houses are mostly low, very few above two stories in height, and built of brick, stone, or wood. The pagodas are numerous and extensive; one of them, situated on the island of Honan on the opposite shore of the river, covering an area of seven acres. There is also a Mohammedan mosque dating from the ninth century. Among other interesting buildings are the Examination Hall, the arsenal, and the mint. There are a Gothic cathedral erected by the French mission; a hospital, founded in 1835 by

the American mission; and an ancient foundling asylum.

Canton is one of the principal seats of the Chinese silk industry; it also produces cotton goods, embroideries, paper, tea, and metal ware. A peculiar kind of porcelain, covered with golden and greenish patterns, known as Canton ware, is made in the factories of Kiang-si and merely painted in Canton. Owing to its advantageous position, Canton very early attracted the attention of foreign merchants. The Arabs traded there as early as the ninth century. The first attempt by European Powers to open commercial relations with Canton was made in 1517, when a Portuguese mission was sent to Peking with such an object in view. The Dutch began to trade with the city later in the century, but were soon superseded by the British, who after several unsuccessful attempts established a factory in Canton in 1684, when the entire foreign trade of China was confined to that city. From 1684 to 1834 the Chinese trade with Great Britain was a monopoly of the East India Company, when the British trade with China was confined to a few "hong" merchants, who acted as intermediaries in all matters affecting the government and aliens. The aversion of the natives to foreigners, coupled with the interference of the Chinese government with the importation of opium (amounting, in 1837, to 30,000 chests), brought about a declaration of war by Great Britain in 1839. In 1841 the Bogue forts, guarding the approach to Canton, were reduced by the British, and the occupation of the city itself was averted only by the payment of a ransom of \$6,087,500. The conclusion of the Treaty of Nanking in 1842 and the subsequent opening of new treaty ports had a detrimental effect on the commerce of Canton. Fresh outbreaks on the part of the natives in 1856 were followed by the military occupation of the city by French and British troops from 1857 to 1861, since when Canton has been practically open to foreign trade and residence.

The commercial relations of the United States with Canton and China date from 1784. The exportation of cotton from the United States to Canton began in the last decade of the eighteenth century, and the product has since become one of the chief exports from the United States to China. The chief exports from Canton are tea, silk, matting, firecrackers, oils, paper, and preserves. The chief imports are cotton and cotton goods, woolen and metal goods, petroleum, etc. Opium, which still figures among the principal staples, is liable to fluctuate according to the success of government prohibition with the population, counteracted by occasional revolutionary outbreaks. The direct foreign imports and exports of Canton in 1912 were \$19,089,000 and \$30,959,000 respectively. The total trade in 1912 amounted to approximately \$71,166,000. The harbor is shallow. Large vessels are obliged to discharge their cargoes at Whampoa, over 10 miles below Canton, from which place they are brought to the city by lighters and steam launches. The annual shipping of Canton amounts nearly to 5,000,000 tons, of which nearly three-fourths is in British bottoms. Canton has steam communication with Hongkong, Macao, and Shanghai, and practically every commodity brought into Canton from Europe and America passes through Hongkong. Estimates of the population vary greatly; one made in consular reports in 1909 placed it at 1,250,000, which is

probably too high. Canton is the principal port in the south of China and has during recent years been the seat of revolutionary movements, first against the dispossessed Imperial government and then against the present republic. Trade has suffered under the disturbances following these rebellions, but not in so high a degree as one might have expected. Since 1911 a scheme of opening near Macao a free port resembling the one at Kiaochow has been under discussion. This might become a rival to Hongkong, though it does not seem to afford harbor accommodations comparable to those of the British colony.

CANTON. A town in Hartford Co., Conn., including the village of Canton, Canton Centre, North Canton, and Collinsville, 15 miles (direct) northwest of Hartford, on the Central New England Railroad, and on Farmington River (Map: Connecticut, D 2). The chief industries are the bottling of plain and carbonated waters and the manufacture of edge tools. Pop., 1900, 2678; 1910, 2732.

CANTON. A city in Fulton Co., Ill., 28 miles west of Peoria, on the Toledo, Peoria, and Western, and the Chicago, Burlington, and Quincy railroads (Map: Illinois, B 3). It is the centre of a fertile agricultural district and has coal-mining interests, extensive agricultural implement works, patent racks, and cigar and cigar-box factories, foundries, tile, brick, and marble works, lumber yards, etc. The city has a public library, two theatres, parks, and a hospital. Settled about 1832, Canton was incorporated first in 1849. Under a charter of 1892 the government is vested in a mayor, elected every two years, and a city council. There are municipal water works. Pop., 1900, 6564; 1910, 10,453; 1920, 10,928.

CANTON. A town, including several villages, in Norfolk Co., Mass., 14 miles (direct) southwest of Boston, on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 3). It is the seat of the Massachusetts Hospital School and has a public library. The manufactures include woolen, rubber, and felt goods, blacking, leather dressing, cotton padings, electrical supplies, patent and enameled leathers, fire hose, sizing compounds, etc. Settled about 1690, Canton was set off from Stoughton and incorporated in 1797. The government is administered by town meetings. The water works are owned by the town. Pop., 1890, 4538; 1900, 4584; 1910, 4797. Consult Huntton, *History of the Town of Canton* (Cambridge, 1893).

CANTON. A city and the county seat of Madison Co., Miss., 23 miles north of Jackson, on the Illinois Central Railroad (Map: Mississippi, E 5). It is the centre of a fertile fruit and vegetable growing region, and has cotton gins and compresses, cottonseed-oil mills, and an ice factory, and manufactures brick, lumber, etc. The water works and electric light plant are owned by the city. Pop., 1890, 2131; 1900, 3404; 1910, 3929.

CANTON. A town in Lewis Co., Mo., 157 miles northwest of St. Louis, on the St. Louis, Hannibal, Quincy, and Burlington Railroad (Map: Missouri, E 1). Advantageously situated on the Mississippi River, it is an important lumber-shipping point and has a large planing mill, button factories, canning and pickle works, and a creamery; poultry raising and the shipping of fish are also important industries. The town

is the seat of Christian University (Christian), organized in 1853. Settled about 1831, Canton was incorporated 20 years later; the charter now governing the town dates from 1873, and provides for a mayor, elected annually, and a board of trustees. The town owns and operates its water works and electric light plant. Pop., 1900, 2365; 1910, 2218.

CANTON. A village and the county seat of St. Lawrence Co., N. Y., 18 miles (direct) southeast of Ogdensburg, on the De Grasse River, and on the New York Central Railroad (Map: New York, E 1). It is the seat of St. Lawrence University, established in 1856, a Universalist Theological School, a State school of agriculture, United States Weather Bureau station, county almshouse, and contains a public library. The village is engaged in the building of small boats and launches, skiffs and sailing yachts, and carries on a trade in farm and dairy products. Other industries are foundries, and flour and feed mills. Good water power is derived from the river. Canton was settled about 1803 and was incorporated in 1846; it was the home of Gov. Silas Wright, who is buried here. The water works are publicly owned and are operated by the municipality. Pop., 1890, 2580; 1900, 2757; 1910, 2701.

CANTON. A city and the county seat of Stark Co., Ohio, 58 miles by rail south-southeast of Cleveland, on the Nimishillen Creek, and on the Wheeling and Lake Erie, the Baltimore and Ohio, and the Pennsylvania railroads (Map: Ohio, H 4). Among the more noteworthy features of the city are the United States government building, city hall, large city auditorium, county courthouse, county workhouse, high school, Meyers Lake Park, Aultman Hospital, Mercy Hospital, Nimisilla Park, Carnegie library, the McKinley National Monument, and two monuments erected to the soldiers of the Spanish-American War. Canton was first settled about 1805, was incorporated as a village in 1822, and was chartered as a city in 1854. It was the home of President McKinley. Canton is in a fine wheat-growing district, and coal, limestone, and clay for pottery and brick are found in the vicinity. Its manufactures include watch cases and movements, iron bridges, and roofing, threshers, engines, mill machinery, rubber tires, metal ceilings, surgical chairs, plows, bookcases, steel, steel cars, cutlery, saddlery, hardware, stoves, safes, woolens, presses, pottery, tiles, and various kinds of brick; and besides these articles, large amounts of grain and coal are exported. Under a general law of 1902, the government is vested in a mayor, president of council, treasurer, solicitor, director of public service, auditor, and director of public safety, appointed by the mayor, with the consent of the council. This body consists of nine members, six being elected by wards and three by the electors of the city at large. The city's income and expenditures exceed \$660,000 annually. The principal items of expense are \$42,000 for the police department, including amounts for police courts, jails, reformatories, etc.; \$60,000 for the fire department; and \$320,000 for schools. The water works are owned by the municipality. Pop., 1860, 4041; 1900, 50,667; 1910, 50,217; 1920, 57,091.

CANTON. A city and the county seat of Lincoln Co., S. Dak., 70 miles by rail north by west of Sioux City, Iowa, on the Big Sioux River, which affords fine water power, and on

the Chicago, Milwaukee, and St. Paul Railroad (Map: South Dakota, H 4). It is the seat of Augustana College and of the United States government asylum for insane Indians, and has a fine courthouse and a Carnegie library. The city contains several grain elevators, exports flour, grain, and live stock, and manufactures plows, gasoline engines, and cement-block machinery. The water works are owned by the municipality, which adopted the commission form of government in 1909. Pop., 1890, 1101; 1900, 1943; 1910, 2103.

CANTON, JOHN (1718-72). An English physicist, born at Stroud, Gloucestershire. He was apprenticed to a weaver and later was taken into partnership by a London schoolmaster, to whom, in 1837, he had articulated himself. He began early to experiment with electricity, and in 1750 read a paper on the *Method of Making Artificial Magnets without the Use of Natural Ones*. In 1751 he was elected a fellow of the Royal Society and awarded the Copley medal. He and Franklin almost simultaneously discovered that some clouds were charged with positive and others with negative electricity. Canton determined the quantity of electricity stored up in Leyden jars, demonstrated the compressibility of water, and made several other important contributions to physical science.

CANTON, WILLIAM (1845-1926). An English author. He was born in the island of Chusan, off the coast of China, and was educated in Jamaica and at Douay, France, for the Catholic priesthood. He became a Protestant, however; and was for long a leader writer on the *Glasgow Herald* and in 1891-99 was subeditor of the *Contemporary Review*. He wrote: *The Shining Waif* (1879); *A Lost Epic and Other Poems* (1887); *The Invisible Playmate* (1894); *W. V., Her Book* (1896; enlarged, 1897); *In Memory of W. V.* (1901), a charming account of his short-lived daughter; *A Child's Book of Saints* (1898; published in America as *W. V.'s Golden Legend*); *Children's Sayings* (1900); *What is the Bible Society?* (1903); a valuable *History of the British and Foreign Bible Society* (5 vols., 1903-10); *The Story of the Bible Society* (1904); *The Bible and the English People* (1911); *A Child's Book of Warriors* (1912); *The Story of St. Elizabeth of Hungary* (1912). Consult a sketch by S. Bradbury in the *Manchester Quarterly*, xxv (1906).

CANTONI, kàn-tō'nè, CARLO (1840-1906). An Italian philosopher, born at Gropello in the Province of Pavia. He studied at the universities of Turin, Berlin, and Göttingen, and taught in Turin and Milan until 1878, when he was made professor of philosophy at the University of Pavia. Although a disciple of Kant, he sought to modify many of that philosopher's doctrines, and combated his theory of the dualism of *phenomenon* and *noumenon*. His works include: *Giovanni Battista Vico* (1864); *Corso elementare di filosofia* (3 vols., 1870, frequently reëdited); *Emanuele Kant* (3 vols., 1879-84); *Psicologia* (2d ed., 1897). Consult: Werner, *Kant in Italien* (Vienna, 1881) and his *Die italienische Philosophie des 19 Jahrhunderts* (Vienna, 1886).

CANTONMENTS (Fr. *cantonnement*, from *cantonner*, to quarter. from *canton*, quarter), MILITARY. A more or less permanent camp or district, in which soldiers are quartered. In

Europe, before the era of railroads and modern scientific warfare and transport, there would be frequently long intervals between active operations, caused principally by the state of the weather, winter, etc.; impassable roads; local or general armistices; and the constantly recurring necessity of waiting for supplies. In such intervals the troops would go either into a permanent camp of huts, or else be quartered in the houses and villages of the district, when they were said to be in cantonments. *Billeting* is the assignment of troops to public or private buildings for quarters. (See *CAMP*; *BRIGADE*.) Its most modern military usage is in India, where the cantonment is practically a military town, and in the majority of instances the district inside whose borders live the European part of the population, civil as well as military. Cantonments are built throughout British India, the larger examples containing barracks for European cavalry, infantry, and artillery; rows of bungalows or houses, each, as a rule, inclosed in a garden, for the officers; rows of huts for the native troops; magazines, gymnasiums, and parade grounds; public offices and administration buildings; and a bazar, more particularly for the accommodation of the native troops.

CANTOR, GEORG (1845-). A German mathematician, born at St. Petersburg. He became professor of mathematics at the University of Halle in 1879, and founded the mathematical theory of assemblages or systems of numbers. Such a system may contain a finite or an infinite number of numbers, or an infinity of such infinities. In the last case Cantor introduced the term "transfinite numbers." He also classified the systems according to their "potency," or degree of infinitude. Several of his papers are published in the *Mathematische Annalen*.

CANTOR, MORITZ (1829-). A German mathematician, born at Mannheim, and privat-docent and professor of mathematics in the University of Heidelberg after 1853. His most notable work is the great "History of Mathematics" (*Geschichte der Mathematik*), whose four volumes (Leipzig, 1880-1909) cover the subject down to the year 1799.

CANTÙ, kàn-tō', CESARE (1804-95). A distinguished Italian historian and novelist, born at Brivio, near Milan, Dec. 5, 1804. He was educated at Sondrio, where at 17 he became instructor in belles-lettres, leaving after four years, to accept a professorship, first in Como and later in Milan. The liberal tendencies expressed in a work published in 1832, *Lombardy in the Seventeenth Century: An Historical Commentary on the "Promessi Sposi" of Manzoni*, resulted in an imprisonment of 13 months. Cantù spent his enforced leisure in describing the sorrows of prison life in the form of a widely read historical romance, *Margherita Pusterla* (1835). His great work is the *Storia Universale* (35 vols., Turin, 1837 et seq.), based largely upon French and German sources, but uniformly colored with a strong clerical bias. Next in importance is his *History of the Italians* (6 vols., Turin, 1854). The following also deserve mention: *History of Italian Literature* (1865); *Independence of Italy* (1872); *Milan: A History of the People for the People* (1871). He wrote, besides, many monographs upon Parini, Beccaria, Monti, and other men of letters. Cantù became director of the archives of Lombardy in 1874. He died in Milan,

March 11, 1895. Consult Bertolini, *Cesare Cantù e le sue opere* (Florence, 1895).

CANTUS FIRMUS (Lat., firm song). A term first applied in the twelfth century to any plain chant melody against which a higher part, the *discantus*, was written. Later on, especially in the fifteenth and sixteenth centuries, the masters of the *a cappella* style used such melodies, or even secular folk song, somewhat in the nature of a typical phrase or leading motive, on which they built up elaborate contrapuntal works. Thus Palestrina (q.v.) calls one of his masses *Assumpta est Maria*, because he begins each number with the Gregorian melody of that hymn in the tenor; in other words, he uses that melody as a *cantus firmus*. In like manner all of Bach's choral preludes are built upon some chorale as a *cantus firmus*.

CANUCK'. A name applied in the United States to any Canadian, while the English Canadians use it to denote a Canadian of French descent. According to Norton's *Political Americanisms*, it was first applied by the French to the English, and is a corruption of Connaught. Some scholars, however, believe the word to be of Indian origin.

CANULEIUS, GAIUS. A Roman tribune of the people. In 445 B.C. he proposed the *Lex Canuleia*, a law establishing the right of intermarriage between the patricians and the plebeians. He also proposed that one of the two consuls should be chosen annually from among the plebeians, but this proposal was not carried, and it was resolved instead that military tribunes with consular power should be elected from either the patricians or the plebeians in place of the consuls. Consult: Livy, iv, chaps. 1, 2, 3, 6; Cicero, *De Republica*, ii, 37, 63; Greenidge, *Roman Public Life*, pp. 112-114 (London, 1901).

CANUN, kâ-nūn' (Arab. *qānūn*, borrowed from Gk. *kanōn*, *kanōn*, straight bar, rule, norm). A Turkish musical instrument, provided with gut strings—a variety of the dulcimer or zither. The sounds are produced by striking the strings by means of plectra—tortoise-shell thimbles ending in pointed pieces of coconut. This instrument is a great favorite in the seraglios.

CANUSIUM. See CANOSA DI PUGLIA.

CANUTE, ka-nūt', or **CNUT, knōt** (c.995-1035). King of the English, Danes, and Norwegians, and known as the Great. He was the son of Sweyn. King of the Danes, and on the death of his father, in 1014, was proclaimed King of England by the warriors of the Danish fleet who were then ravaging the country. The Witan, however, summoned the old King, Ethelred, from his exile in Normandy, where he had been driven by Sweyn, and Canute was forced to flee to Denmark. He returned in 1015 with a powerful fleet and within a year made himself master of all England, save London, being chosen King by a Rump Witan after the death of Ethelred in 1016. The citizens of London proclaimed Edmund Ironside, son of Ethelred, King, and a fierce contest ensued in which London was twice besieged and five battles were fought, the decisive engagement occurring at Ashington, or Assandun, in Essex in 1016. Though Edmund was defeated, Canute, to avoid further resistance on his part, agreed to share the sovereignty with him, most of the south of England going to Edmund and the north to Canute, with the stipulation that on the death of either without heirs the full power was to revert to the survivor. Edmund Ironside died within a few weeks, in

1016, not without the suspicion of foul play on the part of Canute, who lost no time in securing his position as sole ruler of England. He had been noted for his cruelty, and now, to remove all potential rivals out of his way, he entered upon a rapid but systematic course of murder and persecution. By 1018 he had thoroughly pacified the country and considered himself strong enough to dispense with the support of the fleet, which he sent home to Denmark, keeping only the crews of 40 ships as a sort of bodyguard. In 1019 Canute went to claim the Kingdom of Denmark, as his brother had died, but remained only a few months. After 1020 the character of Canute's rule underwent a remarkable change. Mildness was substituted for severity, and respect for the laws for violence. The ancient customs of the country were confirmed and elaborated, and the administration of justice was securely founded. Englishmen were admitted to the highest offices in the land, and soon after this time the Saxon Earl Godwin laid the beginnings of his great power. Canute showed himself especially kindly to the clergy, whose rights he scrupulously respected and whose favor he gained by numerous benefactions to churches and monasteries. With the mass of the people he was popular on account of his liberality and an air of bluff good nature which he knew well how to assume. In 1027 he made a pilgrimage to Rome, describing the events of his journey in a letter to his people replete with moral exhortations and expressions of religious humility, which may be the result either of great naïveté or of fine histrionic skill. Canute was King of both England and Denmark and in 1028 he became ruler, also, of Norway, although his rule was contested until the death of King Olaf in 1030. Together with his conquests in the Wendic lands of Germany, he was therefore the master of a powerful northern empire, which, however, fell to pieces at his death. This occurred at Shaftesbury, Nov. 12, 1035. As King of England, Canute had displayed high talents for rule. By nature cruel and violent, he knew how to subordinate his passions to the interests of his government and his people; and, though practically a heathen at the time of his accession to the throne, he succeeded in winning the favor of a church which has associated one of the most beautiful of mediæval legends, that of the King and the rising tide, with his name. Consult: Larson, *Canute the Great* (New York and London, 1912); Freeman, *The Norman Conquest*, vol. i (Oxford, 1870); Green, *The Conquest of England* (London, 1883).

CANUTE IV, THE SAINT (?-1086). King of Denmark after 1080. He was distinguished as a warrior and a builder of churches. He attempted to invade England in 1085; was murdered by rebels on July 10, 1086, and was canonized in 1100. He is the patron saint of Denmark.

CANVAS (OF. *canevas*, ML. *cannevasium*, from Lat. *cannabis*, hemp). A strong coarse cloth made of cotton, flax, or hemp. Canvas is used (1) on board ship for sails, awnings, hatch hoods, boat covers, tarpaulins, etc. Flax canvas is used for the sails of large vessels. It is woven in cloths 24 inches in width and 40 yards long, and is of several weights, denoted by numbers from 1 to 9. The heaviest, which is called number 1, is used for storm sails,

courses (foresail and mainsail of square-rigged vessels), and topsails, but numbers 2 and 3 are also used for all of these except the storm sails. The lighter weights are used for jibs, upper staysails, topgallant sails, royals, etc. Cotton canvas is used for boat sails, hammocks, etc. The term "canvas" is used in a figurative sense for the sails of a ship, *under canvas* signifying "undersail"—i.e., under way, propelled by sails. See **SAIL**.

2. The canvas used by artists is commonly of linen, varying in density and thickness according to the size of the painting to be made. This is stretched upon a wooden mortised frame, which is called a stretcher, in the four inside corners of which are slits for receiving triangular wooden wedges. These wedges are called keys, and after the canvas is stretched they may be driven in, in order to tighten the canvas itself. Certain sizes of canvas, being in greater request than others, are kept ready stretched on frames. Those used for portraits are known by the names of *kit-cat*, which measures 28 or 29 inches by 36; *three-quarters*, 25 by 30 inches; *half length*, 40 by 50; *Bishop's half length*, 44 or 45 by 56; *Bishop's whole length*, 58 by 94.

CANVASBACK. An American fresh-water duck (*Marila vallisneria*), regarded as superior to all others for food. It breeds from Dakota northward, but most numerous in the far north, making its nest on the ground, in a marsh, and laying 6 to 10 greenish-buff eggs. (For illustration, see Plate of DUCKS, WILD.) The canvasbacks begin to come southward along inland waterways in November and spread over all the middle and southern United States. They are attracted in greatest numbers to the extensive marshes and river flats about Lakes Huron and Erie and around Chesapeake Bay, but are also irregularly numerous wherever their favorite food grows in the Mississippi valley and on the "slews" of the plains. This food is the wild celery (*Zostera vallisneria*), which grows densely on fresh-water shoals in from 1 to 9 feet of water, like a tall grass, the root of which is white and has some resemblance to small celery. "Wherever this plant grows in abundance, the canvasbacks may be expected," says Wilson; "while in waters unprovided with this nutritious plant they are altogether unknown. . . . They float about these shoals, diving and tearing up the grass by the roots, which is the only part they eat." It is not quite true to say that they will eat nothing else, for celery is not always available. They are extremely shy, quick and strong in flight, and remarkably expert in diving, so that all the skill and strategy at the disposal of the gunner is necessary to success in shooting them. They are so relentlessly pursued, however, that their numbers are far less in all their haunts than formerly; and very many of the alleged canvasbacks sent to market are really redheads (q.v.), a closely related and nearly as good duck, of similar habits, but less strongly addicted to the celery diet. The male canvasback has a head reddish, but much obscured with dusky tints, while that of the redhead is clear, bright chestnut, and the bill is blackish (not blue). The back and sides are whitish (less dark than that of the redhead), marked with sparse, wavy lines and dots, suggesting the surface of coarse canvas. The fore part of the body, rump, and tail coverts are black; speculum,

bluish gray; length, about 20 inches. Consult Elliot, *Wild Fowl of North America* (New York, 1898).

CANZONE, kân-tsô'nâ (It., from Provençal *cansò* or *canson*, from Lat. *cantio*, song). The name of one of the oldest and most widely cultivated forms of the Italian lyric. In Provençal the word meant simply any verses to be set to music. The Italians gave it a more technical and specific meaning, as for instance, in the best early treatise on the subject in Dante's *De vulgari eloquentia* (bk. ii, chap. viii-x). This early canzone was a group of *stanze* (stanzas) or strophes not limited as to length or number, but following a systematic scheme. The "regular" strophe fell into two parts—the first called the *pièdi* (feet), the second called the *sirima* (from Greek *σύρμα*, something dragged). The *sirima* was connected with the *pièdi* usually by a single verse called the *chiave* (key). The *pièdi*, or feet of the first part, were usually two in number, rhyming either *a, b, c, a, b, c*, or in the four verse "foot," *a, b, c, d, a, b, c, d*. The first part thus would contain either 6 or 8 verses. Then followed the *chiave* (key), rhyming with *c* or *d* (the last verse of the *pièdi*), but belonging syntactically and in meaning to the second part of the stanza. Any order of rhymes was possible in the *sirima*, or second part, as for instance, *a, b, b, a, c, c*, or *a, a, b, c, b, c*, etc. At the end of the canzone came the *invio* (envoi or address), which usually followed the rhyme scheme of the *sirima*, save that often the first verse had no corresponding rhyme. The verses prevailing in the canzone were either of 7 or 11 syllables, alternating with more or less freedom. In general, the canzone was a much freer form than the sonnet. Dante and Petrarch themselves show great variety in its use. Later Italian poets were not slow in departing from all system even within the strophe, and the term *canzone* and its diminutive *canzonetta* came to mean any poem employing varied rhyme schemes or none at all, with alternations of verses of 7 and 11 syllables.

CAONABO, kâ'ô-nâ-bô' (?-1496). A Carib Indian who was cacique of Maguana, Hispaniola (Haiti), in 1492, and a man of marked native ability. He was married to the famous Anacaona and in 1493 captured the fortress of La Navidad, Haiti, and massacred the Spaniards left there by Columbus. In command of 10,000 warriors he headed the general league against the whites in 1494, and long besieged Ojeda and a small band in the fortress of Santo Tomás, hoping and planning to repeat his victory of La Navidad. Columbus had returned in the meanwhile, and Caonabo, giving up the siege for the time being, devoted himself to strengthening the league. He was so engaged when captured by Ojeda, who had followed him with terms of peace from Columbus. In 1496 he was put on a vessel bound for Spain, but died during the voyage.

CAOUTCHOUC, kô'ô'chôok. See **RUBBER**.

CAPACITY (Fr. *capacité*, Lat. *capacitas*, from *capax*, capacious, from *capere*, to hold), **LEGAL**. The power and competency to incur a legal obligation or to enjoy a legal right. Sometimes the test of capacity is natural, and at other times artificial. In the case of citizens of full age, the natural test of rationality or intelligence is usually applied. If one has the ability to understand the nature and effect of the act in which he is engaged, he is legally capable

of doing it. It is in this sense that the phrase *testamentary capacity* is commonly employed. With respect to the enjoyment of rights, however, the test is more often the artificial one of age, coverture, or marriage (in the case of a woman), alienage, and the like. Whether a particular person of full age and sound mind may hold an office or exercise the elective franchise, or acquire particular kinds of property, depends upon artificial rules established by law. See AGE; ALIEN; INFANT; MARRIED WOMEN; OFFICER; VOTER.

CAP À L'AIGLE, kâp à lâ'gl'. See MURRAY BAY.

CAPA'NEUS. One of the Seven against Thebes (q.v.). He defied Jupiter and was struck by lightning while scaling the walls.

CAP-À-PIE, kâp-â-pé' (Fr., head to foot). In the military language of the Middle Ages, a term applied to a knight or soldier armed at all points, or from head to foot, with armor for defense and weapons for attack.

CAPA Y ESPADA, kâ'pâ é ês-pâ'bâ (Sp., cloak and sword), COMEDIAS DE. A name given to the intrigue plays of Calderón and Lope de Vega, which deal with contemporary aristocratic life in Spain, and introduce the "cloak" and "sword" as stock articles of the dress of their principal characters.

CAP DE LA HAGUE, kâp' de lâ ág' (Fr., Cape of The Hague). A promontory of France, forming the northwest extremity of the peninsula of Cotentin, in the Department of Manche (Map: France, E 2). It juts into the English Channel, opposite the island of Alderney, about 16 miles northwest of Cherbourg. It protects, on the east, the roadstead of La Hogue, or Hougue, whence arises the frequent misnomer of Cape La Hogue. The roadstead gave its name to a great sea fight in which the English and Dutch fleets defeated the French in 1692.

CAPE AGULHAS, â-gôô'lyâs. See AGULHAS, CAPE.

CAPE ANN. A cape on the northeast coast and marking the northern limit of Massachusetts Bay, Mass., 31 miles from Boston (Map: Massachusetts, F 2). The cape is marked by two fixed white lights on Thatcher Island, about 900 feet apart, in lat. 42° 38' N., and long. 70° 34' W., 161½ and 165½ feet above mean high water, and visible for 19 nautical miles; there is also a ten-inch steam fog whistle. There are valuable stone quarries at the cape. The whole rocky peninsula, generally included under this name, projects about 10 miles into the Atlantic Ocean. The south and east shores have many attractive summer resorts.

CAPE ARAGO, or GREGORY. A cape on the west coast of Coos Co., Oreg., on the south side of the outer entrance to Coos Bay (Map: Oregon, A 3). A lighthouse with light 84 feet above sea level is in lat. 43° 20' N. and long. 124° 22' W., on a small island 2½ miles north and ½ mile east of the western extremity of the cape. The light is fixed white, with white flash every two minutes.

CAPE BAB-EL-MANDEB, bâb-el-mân'déb. See BAB-EL-MANDEB.

CAPE BARROW, or POINT BARROW (named after Sir John Barrow). The northernmost point of Alaska on the Arctic coast; lat. 71° 23' N., long. 156° 40' W. (Map: Alaska, D 1). It is a whaling station. In 1881-83 the United States Signal Service stationed at Point Barrow

a party of scientists, to take part in the series of international circumpolar observations instituted during 1882-83.

CAPE BLANCO, blâp'kô (Sp., white). A name applied to several capes on the north and west coasts of Africa. The most remarkable of them is the one on the west coast of Sahara, in lat. 20° 45' N. and long. 17° W., near the boundary between the Spanish and French possessions on the west coast of Africa, which shelters the Galgo or Levrier Bay (Map: Africa, C 2). Its name is derived from the white color of the sand. A second Cape Blanco is the northernmost point of Africa, in lat. 37° 20' N. and long. 9° 50' E. (Map: Africa, E 1). A third Cape Blanco is on the west coast of Morocco, in lat. 33° 10' N. and long. 8° 30' W. The same name is also applied to a number of headlands in other parts of the world.

CAPE BLANCO. The westernmost point of Oregon on the Pacific coast in lat. 42° 50' N. and long. 124° 27' W., at the mouth of the Sixes River, and 30 miles north of the mouth of the Rogue River (Map: Oregon, A 7). There is a lighthouse with fixed white lights, 252 feet above sea level on the extreme western point of the cape.

CAPE BOEO, bô-a'ô, or LILIBEO (possibly clipped from *Lilybæum*). The westernmost point of Sicily, a mile from Marsala, which occupies the site of the ancient Lilybæum (Map: Italy, G 10).

CAPE BRETON. A cape at the east extremity of Cape Breton Island, Cape Breton Co., Nova Scotia, Canada, in about lat. 45° 50' N. and long. 59° 46' W. (Map: Nova Scotia, K 3). It is at the entrance to Louisburg harbor, and has a lighthouse. It is the terminus of the submarine telegraph cable to St. Pierre.

CAPE BRETON ISLAND. A rocky island of irregular form in British North America, 110 miles long by about 87 miles broad, between lat. 45° and 47° N., and between long. 60° and 61° 30' W. (Map: Nova Scotia, H 3). It derives its name from a cape at its eastern extremity. It is separated from the peninsula of Nova Scotia by Chebueto or Chedabucto Bay and the Gut of Canso, and is practically divided in two by the land-locked Bras d'Or Lakes and the canal of St. Peter's Isthmus. It contains 3120 square miles. Its picturesque scenery and bracing summer climate attract an annually increasing number of tourists. The principal exports are pine, oak, birch, maple, iron, and coal. The fisheries—of cod, mackerel, herring, and whitefish—employ more than 7,000 men. Though the island produces maize and other grains, it depends for its breadstuffs chiefly on the United States. It is divided into the four districts of Cape Breton, Inverness, Victoria, and Richmond. The towns are Sydney, Arichat, and Port Hood, the once famous Louisburg, stripped of its fortifications, having become a mere village. Cape Breton, originally a French possession, was taken by the English in 1745; but being subsequently restored to France, it was again captured in 1758 and ceded to England in 1763. After having been for a time a distinct colony, it now forms part of the Province of Nova Scotia. Pop., Cape Breton, N. and Victoria, 1891, 24,650; 1911, 29,888; Cape Breton, S., 1891, 35,087; 1911, 53,352. With the exception of several hundred Micmac Indians and 15,000 French Acadians, the inhabitants are chiefly of Scotch Highland descent. Consult: R. Brown, *History of the Island of Cape*

Breton (London, 1869), and *Coal Fields of Cape Breton* (London, 1871); Sir J. G. Bourinot, *Historical and Descriptive Account of the Island of Cape Breton* (Montreal, 1892).

CAPE CANAVERAL. A cape near the middle of the Atlantic coast of Florida in lat. 28° 28' N. and long. 80° 33' W., and about 20 miles southeast of Titusville (Map: Florida, H 3). The United States government maintains on the cape a coast signal station and a lighthouse with light 137 feet above sea level.

CAPE CANSO. The eastern extremity of Nova Scotia and the southern boundary of the entrance of Chebucto or Chedabucto Bay (Map: Nova Scotia, J 3). It is in lat. 45° 21' N. and long. 61° W.

The GUT or STRAIT OF CANSO is a passage 17 miles long and $2\frac{1}{2}$ miles in average breadth, connecting the inlet just mentioned with the Gulf of St. Lawrence, and forming an island of Cape Breton. It is greatly used by local sailing vessels, but of the three channels between the Gulf of St. Lawrence and the open ocean, it is the one that is least frequently used by European vessels.

CAPE CATOCHE, ká-tō'chā. The north-east extremity of the Mexican State of Yucatan, in lat. 21° 35' N. and long. 87° 8' W. (Map: Mexico, P 7). It was here that in 1517 the Spaniards first saw the Mexican coast.

CAPE CHARLES. The point of land at the northeast side of the entrance of Chesapeake Bay, Va., near lat. 37° 3' N. and long. 76° W. (Map: Virginia, H 4). On Smith Island is a first-order flashing white light, signaling 45" every minute, 180 feet above mean high water. This cape is the extreme southern projection of the "Eastern Shore" (q.v.).

CAPE CHELYUSKIN. See SEVERO.

CAPE CLEAR. A headland of Clear Island, county Cork, the southernmost point of Ireland (Map: Ireland, B 5). It rises 400 feet above sea level, has a lighthouse with a bright revolving light 455 feet above the water level, and is usually the first land seen from American steamers approaching England. The Fastnet Rock, with a light 148 feet above high water, is $3\frac{1}{2}$ miles to the southwest.

CAPE COAST, or CAPE COAST CASTLE. A fortified seaport and formerly the capital of the British colony of the Gold Coast, situated southwest of Akkra, the capital of the colony (Map: Africa, D 4). The Portuguese made the first settlement here in 1610, and in 1652 the Swedes built the castle, which they called Carolusburg. It was taken in 1659 by the Dutch, and in 1664 by the English, who have since held it, though it was attacked in 1665 by De Ruyter and in 1757 by the French. It was the capital of the British settlements on the coast until 1876, when the seat of government was removed to Akkra (q.v.). In 1905 it was given municipal government. The port is of some commercial importance, and there is a considerable trade with the interior in palm oil, ivory, and gold. Pop., 1911, 11,364.

CAPE COD. The sickle-shaped peninsula forming the southeastern extremity of Massachusetts and constituting Barnstable County. It extends from Great Herring Pond to Race Point, in lat. 42° 3' 40" N., long. 70° 4' 18" W. (Map: Massachusetts, G 3). It is about 65 miles long from the head of Buzzards Bay and beyond Barnstable in a few places exceeds 8 miles in width. It more than half circles Cape Cod Bay and is

broken by many harbors, that of Provincetown being one of the best on the New England coast. On the seaward side at Highlands is a revolving light 183 feet above mean high water, and at Race Point is a fixed white light varied by a white flash every 90 seconds, 41 feet above high water. Cape Cod was probably visited a number of times by Europeans during the sixteenth century, and earlier maps show a variety of names; but it is usually said to have been discovered by Gosnold (q.v.) in 1602 and named from the abundance of the fish in its waters. Charles II, when Prince of Wales, attempted to change the name to Cape James, in honor of his brother. The cape is sandy and in part consists of rolling grass land; but there are fertile portions, and towards the north it is well wooded. Small ponds abound, and salt marshes border the southern shores. The Old Colony division of the New York, New Haven, and Hartford Railroad extends through the peninsula, and the construction of a ship canal to connect Barnstable and Buzzards bays, a project which has been contemplated since the Colonial days, was chartered in 1906, begun in 1909, and completed in 1914. Consult Thoreau, *Cape Cod* (Boston, 1865).

CAPE COD CANAL. See CANAL.

CAPE COLON'NA (It., column) (ancient *Sunium Promontorium*). A headland of Greece, 28 miles southeast of Athens, forming the southernmost point of Attica, in lat. 37° 38' N., long. 24° 1' E. (Map: Greece, F 4). Crowned by the ruins of a temple of Athene, its summit rising about 270 feet above the water, Cape Colonna is a conspicuous and remarkable object from the sea. It derives its name from the white marble columns of the temple, which are still standing.

CAPE COLONY. See CAPE OF GOOD HOPE.

CAPE COM'ORIN. The southernmost extremity of the peninsula of India. It is in Travancore, lat. 8° 5' N., and long. 77° 37' E. (Map: India, C 7).

CAPE DE GATA, dā gā'tā, or **CABO DE GATA,** kā'bō dā gā'tā. A promontory on the south coast of Spain marking the east side of the mouth of Almeria Bay, in about long. 2° 15' W., and about lat. 36° 40' N. (Map: Spain, D 4). The most notable of its rocks is the ancient Promontorium Charidemi, the Moorish Kheyran, formed chiefly of agates, spars, and crystals. The cape was once a resort for Moorish pirates.

CAPE DIAMOND. The high bluff, situated at the confluence of the St. Charles with the St. Lawrence River, on which stands the citadel of Quebec (Map: Quebec, in Quebec City, G 4). Its precipitous sides rise over 300 feet from the river level. It is just east of the Plains of Abraham.

CAPE DIS'APPOINTMENT. The southwest point of the State of Washington, on the north side of the mouth of the Columbia River, in lat. 46° 16' N., long. 124° 3' W. It has a lighthouse with a light flashing alternately red and white (interval between flashes 15 seconds), at a height of 233 feet above sea level (Map: Washington, A 3).

CAPE DUKATO, dō-kā'tō (probably a corruption of Gk. *Λευκάρις*, *Leukatēs*, by an interchange of *l* and *d*) (anciently *Lucates*). A headland at the south extremity of Santa Maura, one of the Ionian Islands, in lat. 38° 34' N. and long. 20° 32' E. (Map: Greece, B 3). The strong currents around the cape and frequent fierce gales make it very dangerous for naviga-

tion, and the place has long been dreaded by mariners. A cliff about 2000 feet high, on the western side of this Leucadian Promontory, is called Sappho's or Lover's Leap.

CAPE ELIZABETH. A headland in Cumberland Co., Maine, 6 miles southeast of Portland, and in lat. $43^{\circ} 33' N.$, long. $70^{\circ} 12' W.$ (Map: Maine, C 8). The United States government has established two lights on this cape.

CAPE ETERNITY. A headland on the left bank of the Saguenay River, Canada, about 40 miles from its mouth. It rises to a height of 1800 feet, and is the most impressive spectacle in the scenery of the Saguenay and lower St. Lawrence.

CAPE FAREWELL. The southernmost extremity of Greenland, and southern promontory of Egger Island, situated in lat. $59^{\circ} 49' N.$ and long. $43^{\circ} 56' W.$ (Map: North America, under AMERICA, O 4). It is seldom visited, on account of the ice and dangerous currents.

CAPE FEAR. A promontory extending into the Atlantic from Smith Island, N. C., near the mouth of Cape Fear River, in lat. $33^{\circ} 35' N.$ and long. $77^{\circ} 57' W.$ (Map: North Carolina, E 4). Navigation off this cape has long been dreaded by sailors, on account of the treacherous character of the surrounding waters.

CAPE FEAR RIVER. A river in North Carolina, rising in the north central part of the State, flowing southeast, and emptying into the Atlantic (Map: North Carolina, D 3). The largest tributaries are: from the west, Deep River; from the east, South River, and from the northeast, Northeast Cape Fear River. It is over 300 miles in length, and is the longest river wholly within the State. It is navigable to Fayetteville, 150 miles from its mouth. Along the lower region of the river rice growing is an important industry.

CAPEFIGUE, káp'fég', BAPTISTE HONORÉ RAYMOND (1802-72). A French historical writer. He was born in Marseilles, and studied law in Paris. He then became a journalist, and contributed to a large number of publications, signing himself "Un homme d'état." He held a post in the Foreign Office until 1848, and in this way was enabled to use many documents access to which was closed to others. Besides his journalistic work, he produced no less than a hundred volumes of history, many being biographies of famous women and nearly all being hastily written and uncritical, and tinged with his Bourbon political views. The best of his works are the *Histoire de Philippe-Auguste* (4 vols., 1829), and the *Histoire de la réforme, de la ligue, et du règne de Henri IV* (8 vols., 1834-35).

CAPE FINISTERRE, fén'stár' (Fr., from Lat. *finis*, end + *terra*, earth), or LAND'S END (ancient *Promontorium Nerium*). A high promontory at the northwest extremity of Spain, in lat. $42^{\circ} 53' N.$ and long. about $9^{\circ} 16' W.$ (Map: Spain, A 1). It is noted as the scene of two naval victories of the English over the French, on May 3, 1747, and July 22, 1805.

CAPE FLATTERY. The extreme western point of the United States (not including Alaska), in the State of Washington, at the southern side of the entrance to the Strait of Juan de Fuca (Map: Washington, A 1). On Tatoosh Island, in lat. $48^{\circ} 23\frac{1}{2}' N.$ and long. $124^{\circ} 44' W.$, and one-half mile northwest of Cape Flattery, there is, at a height of 155 feet above sea level, a fixed white light, with a fixed red sector between southeast seven-sixteenths

south and south-southeast fifteen-sixteenths east.

CAPE FLORIDA. The southernmost extremity of Key Biscayne, in Dade Co., Fla., about 10 miles southeast of Miami, in lat. $25^{\circ} 38' N.$, long. $80^{\circ} 8' W.$ (Map: Florida, D 4). There is a fixed red beacon light, 31 feet above the sea level, on Cape Florida Shoal.

CAPE FOULWEATHER. A cape on the west coast of Lincoln Co., Ore., in about lat. $44^{\circ} 50' N.$ and about long. $124^{\circ} 5' W.$ (Map: Oregon, A 5).

CAPE GIRARDEAU, jér'ar'dō. A city in the county of the same name, Missouri, 50 miles above Cairo, Ill., on the Mississippi River, and on the Cape Girardeau Northern Railroad and the Frisco Lines (Map: Missouri, G 4). It is in a well-cultivated region and has a large commerce by river and railroad, in lumber, flour, lime, limestone, and mineral paints. There are also manufacturing of Portland cement, shoes, bentwood, bricks, tobacco, washtubs, veneer, threshing machines, beer, etc. The notable institutions include St. Vincent College (Roman Catholic), St. Vincent Academy, the Southeast Missouri State Normal School, St. Francis Hospital, and the Convent of the Sisters of Loretto. The Common Pleas courthouse, Federal building, and city hall are pretentious structures. The government is administered by a mayor, elected biennially, and a city council. Pop., 1900, 4815; 1910, 8475; 1920, 10,252. Cape Girardeau was named after Ensign Girardot, a French officer who established a trading post just above the present site of the city. A public park has been laid out at this place. Here was made the first settlement of English-speaking people in the upper territory of what later became the Louisiana Purchase. Many grants were given by Don Louis Lorimier, the Spanish commandant at Cape Girardeau (whose house is still standing), and between 1780 and 1803 large numbers of persons migrated from the southeastern states.

CAPE GREGORY. See CAPE ARAGO.

CAPE HAITIEN, á'é'tyän' (LE CAP). The second city of Haiti in importance and size (Map: West Indies, D 3). It is situated on the north coast, overlooking a spacious harbor and surrounded by picturesque mountains. The town is well laid out, and has the appearance of the older European towns. Before the earthquake of 1842, it was known as "Little Paris," but as most of the white settlers did not rebuild, the town has not recovered since. During the French occupation, Cape Haitien was the capital of the island. It was bombarded by the English in 1865. The commerce is very important, and the chief exports are coffee, logwood, cacao, hides, and honey. The population is estimated at 30,000.

CAPE HATTERAS. A cape in lat. $35^{\circ} 15' N.$ and long. $75^{\circ} 31' W.$, projecting into the Atlantic from Hatteras Island, a long, narrow, sandy island bordering Pamlico Sound (Map: North Carolina, G 2). It is a dangerous part of the American coast for navigators, on account of shoals and frequent gales and storms. Coasting vessels are apt to pass in toward this cape, on account of the Gulf Stream, which is only about 20 miles east. The cape has a light, flashing every 10 seconds, 191 feet above mean high water; also, about three-quarters of a mile south, a fixed white beacon light, 35 feet above the sea.

CAPE HENLOPEN. A point of land on the east coast of Delaware, in lat. $38^{\circ} 47' N.$ and long. $75^{\circ} 5' W.$, at the south side of the entrance to Delaware Bay (Map: Delaware, Q 5). It is about 13 miles a little west of south of Cape May, on the opposite New Jersey shore. The Cape Henlopen light, 126 feet above sea level, is a fixed white light, with a fixed red sector between southeast one-eighth east and south one-eighth east.

CAPE HENRY. A point of land on the coast of Virginia, in lat. $36^{\circ} 56' N.$ and long. $76^{\circ} 1' W.$, at the south entrance to Chesapeake Bay, opposite Cape Charles (Map: Virginia, J 5). Cape Henry has a life-saving station and a lighthouse. The light is 157 feet above sea level, shows fixed white, with a fixed red sector between south-southeast and southwest by west.

CAPE HORN (from *Hoorn*, a city of Holland), or **HOORN.** The southernmost point of America, terminating an island of its own name, in the archipelago of Tierra del Fuego (Map: Chile, D 15). It is situated in lat. $55^{\circ} 59' S.$ and long. $67^{\circ} 16' W.$ It has a perennially Antarctic climate, and is merely a detached link, bare and rugged, of the chain of the Andes. It was discovered by Schouten, a native of Hoorn, in Holland, in 1616, about 90 years later than the Strait of Magellan, and since then the course of navigation of sailing vessels has been round the cape, instead of through the strait.

CAPE HUNTING DOG. See **HUNTING DOG.**

CAPE JASMINE. See **JASMINE.**

CAPE LA HOGE. See **CAP DE LA HAGUE.**

CAPEL, ARTHUR, LORD (c.1610-49). An English Royalist leader during the Revolution. He represented Hertford in both the Short Parliament and the Long Parliament, and sided with the popular party under the leadership of Pym, in demanding merely a redress of grievances; but, strongly opposing revolution, he joined the Court party, and in August, 1641, was made Lord Capel of Hadham. He became an officer in the Royalist army, and in 1643 lieutenant general of Shropshire, Cheshire, and North Wales. He was a member of the advisory council of the Prince of Wales, and when the Parliament party succeeded retired to his estate at Hadham; but in 1648 he advocated the renewal of civil war, and attempted to hold Colchester against the forces of Lord Fairfax. He surrendered on assurance that his life would be spared. The civil authorities regarded the pledge given him as null, and they imprisoned him. He escaped from the Tower, was taken, tried and convicted of treason, and on March 9, 1649, was beheaded with the Duke of Hamilton and the Earl of Holland.

CAPEL, THOMAS JOHN (1836-1911). An English Roman Catholic priest, born Oct. 28, 1836. When but 17 years old he, with others, founded a normal training college in London for the education of school teachers, of which, in 1856, he was made vice principal. Being compelled to seek southern Europe on account of ill health, he founded at Pau a mission for English-speaking Roman Catholics, in consequence of which the Pope gave him the rank of "monsignore." Returning to England in 1873, he established the Roman Catholic University (1874-78) at Kensington, and devoted much of his time to preaching, becoming widely noted for his eloquence, and was particularly successful in making converts to Romanism among the gentry of the Church of England. In 1883 he

went to America and made his home in California. He is said to be the original of Catesby in Disraeli's *Lothair*. In 1874 he published a *Reply to Gladstone's Political Expostulation*, and in 1884 "*Catholic, an Essential and Exclusive Attribute of the True Church*."

CAPELL, EDWARD (1713-81). A critical editor of Shakespeare, born at Throston, near Bury St. Edmunds. He was educated at Catharine's Hall, Cambridge, appointed deputy inspector of plays in 1737, and devoted his life to the study of Shakespeare, whose plays he transcribed 10 times. In 1760 he published *Prologues, or Select Pieces of Ancient Poetry*, including a reprint of *Edvard III.*, as possibly Shakespeare's. His edition of Shakespeare (10 vols., 1768) was followed by commentaries in three vols., which were not all published till 1783, two years after Capell's death. They bore the title, *Notes and Various Readings of Shakespeare*. Capell collated the quartos and the first two folios more carefully than any previous editor.

CAPELLA (Lat., kid). A bright star of the first magnitude, on the left shoulder of Auriga. In 1899, Campbell, of the Lick Observatory, and Newall, of the Cambridge Observatory, simultaneously discovered it to be a spectroscopic binary (q.v.) with a period of 104 days. It is one of Secchi's second type, or solar stars, so called because their spectra closely resemble that of the sun in being finely ruled with dark lines owing to the presence of metallic vapors. Its parallax, as determined by Elkin at New Haven, is $0''.08$, corresponding to a distance of nearly 26,000,000 times the distance of the earth from the sun, a distance so great that the light of the star takes about 40 years to reach us. Capella is also called Capra, or the *She-Goat*, a name also sometimes given to Capricorn. The poets fable Capella to be Amalthea's goat, which suckled Jupiter in his infancy.

CAPELLA, MARTIANUS MINNEUS FELIX. A learned author of the second half of the fifth century. He was born in Africa, perhaps at Madaura. Of his life nothing whatever is known. He wrote the *Satiricon*, a kind of encyclopædia, highly esteemed during the Middle Ages as a work of reference. It is written in a medley of prose and verse, and is full of curious learning, but possesses no literary value. The style has all the bombastic pomp of the African school of later Latinists. It consists of nine books. The first two constitute an allegory, *The Nuptials of Philology and Mercury*, while the remaining seven are devoted to the "liberal arts," the sum of all human knowledge—grammar, dialectics, rhetoric, geometry, arithmetic, astronomy, and music. Each art is represented as a courtier of Philology and Mercury. Capella was much indebted to Varro, Pliny the Elder, and other writers.

The book on astronomy (book viii) is remarkable as containing a hint of the true theory of the solar system. Mercury and Venus are there declared to move around the sun, and not around the earth, and their relation to these bodies is properly explained. It has been thought that Copernicus (q.v.) derived a hint of his own system from Capella's work, from which he quotes. The best edition is that of Eyssenhart (Leipzig, 1866). Consult Teuffel, *Geschichte der römischen Litteratur* (6th ed., Leipzig, 1913).

CAPELLINI, kă'pĕl-ĭ-nĕ, GIOVANNI (1833-). An Italian geologist, born in Spezia.

He studied at the University of Pisa, and in 1860 was appointed professor in Genoa. Subsequently he was called to be professor of geology and paleontology in Bologna. He was one of the first Italian scientists to accept the Darwinian theory. He founded in Bologna a geological museum, and originated the international congress for anthropology and prehistoric archaeology. His publications include: *Delfini fossili del Bolognese* (1864); *Relazione d'un viaggio scientifico nell' America settentrionale* (1867); and *Armi e utensili di pietra del Bolognese* (1870).

CAPELLO, kâ-pêl'lo, or **CAPPELLO** (It., hair), **BIANCA** (1548-87). An Italian adventureress, wife of Francesco de' Medici. She was born of a noble Venetian family, and in 1563 eloped to Florence with Pietro Bonaventuri. Soon afterward she formed a liaison with Francesco de' Medici, who had recently married Joanna, Archduchess of Austria. Bonaventuri was appointed to a court position, and in 1572 was murdered—possibly at the order of Francesco. The lack of a male heir was a source of great sorrow to Francesco, and in 1576 Bianca foisted on him a child, whom the Duke named Antonio. To prevent detection, she caused the assassination of those who assisted her in the fraud. Three months after the death of Joanna in 1578, Bianca persuaded the Grand Duke to marry her publicly; they had been privately married immediately after Joanna's death. The marriage was approved by Philip II of Spain, and in October, 1579, Bianca was proclaimed Grand Duchess of Tuscany. She endeavored to secure the good will of the Medici family, and particularly of the Cardinal Ferdinand, brother and next heir to Francesco. In 1587 the two brothers and Bianca met at Poggio a Cajano, and a few days later the Grand Duke and his wife were suddenly taken ill and both died. Ferdinand has been accused of having poisoned them. Another story is that Bianca had prepared a poisoned tart for the Cardinal, who urged Francesco to taste it first, and that then Bianca swallowed some of it rather than survive her husband. Probably neither of the deaths was due to poison. Though she kept her power over the affections of her prince, Bianca did not succeed in making Antonio his successor. Many stories of her cruelty and propensity for magical arts are part of the popular tradition of Florence to-day. Consult: Saltini, *Della morte di Francesco de' Medici e di Bianca Capello* (Florence, 1863); *Tragedie Medicee domestiche* (ib., 1898); Steegman, *Bianca Cappello* (Baltimore, 1913).

CAPE LOOK'OUT. A point of land on the east coast of North Carolina, 63 miles southwest of Cape Hatteras, and 12 miles southeast of Beaufort, in lat. 34° 37' N. and long. 76° 31' W. (Map: North Carolina, F 3). The lighthouse on this point has a fixed white light 156 feet above mean high water.

CAPE MATAPAN, mâ'tâ-pân'. The southernmost extremity of Greece, between the gulfs of Laconia and Messenia, in lat. 36° 23' N. and long. 22° 29' E. (Map: Greece, D 5). The ancient Greeks called it Tænaron, and made it sacred to Neptune, whose temple stood near the cape.

CAPE MAY. The southern point of New Jersey, on the north side of the entrance to Delaware Bay (Map: New Jersey, C 5). A lighthouse with light flashing every thirty seconds, 164½ feet above mean high water, is located here.

CAPE MAY CITY. A popular seashore resort, one of the oldest along the coast, formerly called Cape Island. It is the southernmost city of New Jersey, situated in Cape May County, 82 miles by rail south of Philadelphia, on the Pennsylvania and the Philadelphia and Reading railroads (Map: New Jersey, C 5). Cape May City has a fine beach, with excellent bathing facilities, a board walk five miles in length, and a driveway along the ocean front. There are also numerous hotels and boarding houses. The industries include fishing, canning, oyster raising, gold beating, and sand washing. Its harbor has an area of 500 acres and an average depth of 35 feet. It is the only port of refuge south of Sandy Hook on the New Jersey coast and is the scene of many important yachting events. The water works are municipally owned. The government is vested in a mayor, elected every three years, and a city council. Pop., 1900, 2257; 1910, 2471.

CAPE MAY COURT HOUSE. A town and the county seat of Cape May Co., N. J., on the Atlantic City and the Pennsylvania railroads, 71 miles south of Philadelphia and 12 miles north of Cape May City (Map: New Jersey, C 5). It contains a prison and two churches and the chief industries are glass blowing, agriculture, and fishing. Pop., 1914 (est.), 1300.

CAPE MENDOCINO, mên'dô-sê'nô. A cape in Humboldt Co., Cal., the extreme western point of the State, in lat. 40° 26' 24" N. and long. 124° 23' 27" W. (Map: California, A 1). On its highest point, 422 feet above sea level, is located a lighthouse of the first class.

CAPE MOLE. See **GOLDEN MOLE**.

CAPEN, EDWARD WARREN (1870-). An American sociologist, born at Jamaica Plain, Mass. He was educated at Amherst College, Hartford Theological Seminary, and Columbia University. In 1902 he became lecturer on sociology at Hartford Theological Seminary, engaged in special sociological and missionary research in the Far East in 1907-09, and in 1910 was one of the organizers of the World Missionary Conference at Edinburgh. In 1911 he became organizing secretary of the Hartford School of Missions. He wrote "Historical Development of the Poor Law of Connecticut" in the *Columbia University Series* (New York, 1905).

CAPEN, ELMER HEWITT (1838-1905). An American clergyman and educator, born at Stoughton, Mass. He graduated at Tufts College in 1860, and was admitted to the Suffolk bar in 1863. After studying theology, he was ordained pastor of the Independent Christian Church of Gloucester in 1865, and held pastorates at St. Paul, Minn., and Providence, R. I., from 1869 to 1875, when he became president of Tufts College. Consult A. Tombo, Jr., *In Memoriam E. H. Capen* (New York, 1905).

CAPE NOME. A projection from the western mainland of Alaska, extending into the northwest part of Norton Sound, in about lat. 64½° N. and long. 165° W. In the sands near the seacoast, and in the valleys of the streams, are found very rich deposits of gold, which are easily accessible (Map: Alaska, B 3). (See **NOME**.) Consult Dunham, "The Yukon and Nome Gold Regions," in *Department of Labor Bulletin 11* (Washington, 1900).

CAPE OF GOOD HOPE. A promontory of South Africa, rising 1000 feet above sea level, and popularly regarded as the southernmost point of the continent, though it is half a de-

gree to the north of Cape Agulhas (Map: Africa, F 8). The latter is merely a projection on a coast line, which diverges inconsiderably from a parallel; but the former is really the turning point from south to east on the voyage from Europe to India. It is situated in lat. $34^{\circ} 22'$ S. and long. $18^{\circ} 30'$ E., being the termination of Table Mountain (q.v.). The cape was discovered by Dias, a Portuguese navigator (who christened it the Cape of Storms), as early as 1486—six years before Columbus, in aiming at the same goal by a different route, led the way to America. But it was only in 1497 that Vasco da Gama realized the value of Dias's discovery, by rounding it on his adventurous voyage from Lisbon to Calicut. Besides opening a new channel for the traffic of the East, the discovery of the cape was partly instrumental in removing the trading superiority from the republics of Italy to the states of western Europe.

CAPE OF GOOD HOPE, formerly **CAPE COLONY**. A province of the Union of South Africa, and a British possession in South Africa, between lat. 26° and $34^{\circ} 50'$ S., and long. $16^{\circ} 25'$ and 30° E. (Map: Africa, G 8). It is bounded by German Southwest Africa, Bechuanaland Protectorate, the Orange River Colony, Basutoland, and Natal on the north, the Indian Ocean on the east and south, and the Atlantic on the west. Its area thus defined and including the British possession of Walfish Bay, on the west coast, is 276,995 square miles.

Topography. In its physical aspect Cape of Good Hope presents a series of elevated plateaus bounded by mountain ranges running parallel to the south coast and increasing in altitude towards the north. The first and most southern mountain chain has an altitude of 3000 to 5000 feet and runs along the south coast at a distance not exceeding 50 miles. Several small rivers intersect it in a direction from north to south and divide it into several sections called Swellendam, Lange, Ontenigma Mountains, and a few others. The second mountain chain runs parallel with the first and has an altitude of 5000 to 7000 feet. It is also divided into several sections, known as the White and the Great Black Mountains, and terminates in the summit of Cockscomb (6000 feet high), northwest of Algoa Bay. The third mountain range has an altitude of 6000 to 8000 feet, and reaches in the summit of Compass, which is the highest of Cape of Good Hope, an altitude of 8500 feet. It is also divided into several parts, the principal of which are the Roggeveld, Nieuwveld, Sneeuwbergen, and Stormberg. The plateau inclosed by the second and the third mountain ranges is known by the name of Great Karroo and has an average width of about 60 miles. The west coast of Cape of Good Hope is also traversed by a mountain chain, the Karree Bergen, an offshoot of the western section of the first mountain range. The east coast of the province is almost without a single indentation, in contrast to the south and west coasts, which form a considerable number of bays and capes. The most important are Algoa Bay, Mossel Bay, Cape St. Francis, Cape Agulhas, the southernmost point of Africa, False Bay, Cape of Good Hope, Table Bay, and Saldanha Bay. The chief river of Cape of Good Hope is the Orange River, which forms a great part of the northern boundary. The coast lands are intersected by numerous small rivers and streams, most of them very short and unnavigable, with the exception

of the Breede and the St. John. The inland rivers are very few in number and fall into the Orange River, the Sneeuwbergen marking the division between the Atlantic and the Indian Ocean. Certain indications, such as the numerous saurians and reptiles as well as the dry basins which occur in the Karroos, seem to point to the fact that this part of the province was in former times more abundantly watered.

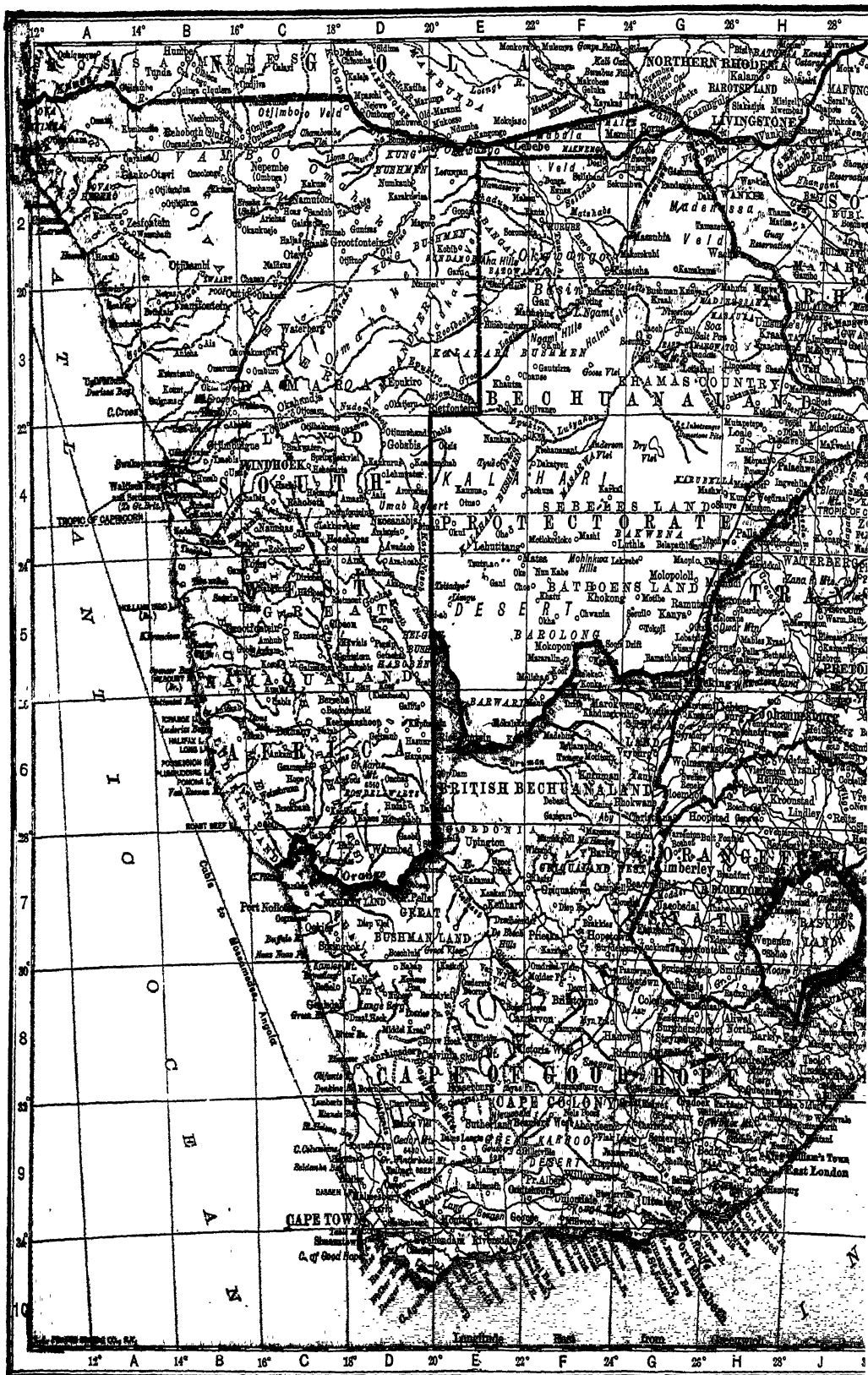
Climate. The climate of Cape of Good Hope is, on the whole, dry and very healthful. Rains are more abundant in the east than in the west. The winters are cold in the elevated regions, and some of the higher mountain tops are covered with snow for a considerable part of the year, but the air is dry and bracing. The annual average at Cape Town is over 62° F.

Flora. The flora of the province varies considerably in accordance with the soil and the climate of the locality. The Karroos are generally covered with many varieties of acacia, euphorbia, and aloë, and are especially rich in bulbous plants. Forests are generally found on the coast lands and furnish many useful varieties of wood, such as the yellow and the black ironwood and several species of palms. Among the cereals the most important is wheat, which is famous for its excellent quality. All the common European fruits grow in abundance, and the production of wine is a very important industry in the province.

Fauna. The fauna of Cape of Good Hope has undergone considerable changes since the settlement of the colony by Europeans, and many species which were formerly common and abundantly represented in that country have either entirely disappeared or are of rare occurrence. Among these may be mentioned the rhinoceros and the giraffe, while the lion and the elephant are found only in the eastern parts of the colony. The hippopotamus is still met with in the Orange and in some other rivers. The various species of the antelope family, as well as jackals, hyenas, and monkeys, are still abundant. Among the birds the most important is the ostrich, which is quite domesticated and furnishes large quantities of feathers, forming one of the staples of the province.

Geology. In their geological formation the mountain ranges of Cape of Good Hope are of almost a uniform character, the base being composed in most cases of granite and covered with quartzose sandstone, in some cases to a thickness of 1500 to 2000 feet. Some of the ranges, such as the Stormberg, still show some signs of comparatively recent volcanic action. The surface of the Karroo is generally composed of sand and clay, with a stratum of blue slaty rock underneath, which keeps it from drying up entirely during the rainless season.

Mineral Resources. The mining industry is of the utmost importance, and Cape of Good Hope is the greatest diamond-producing country in the world. The diamond fields are almost exclusively situated in Griqualand West, and the mining of diamonds has reached a very high degree of development, the output for 1910 amounting to 2,586,295 carats of \$25,653,500 value. It is estimated that from 1867 to 1913 diamonds of the value of over \$500,000,000 were exported. The first discovery of diamonds was made in the Hopetown district in 1867, and by 1870 there were about 10,000 men digging for diamonds along the Vaal River. In the same year the "dry diggings"



were discovered between the Vaal and the Modder rivers, which was soon followed by still richer discoveries in the same vicinity and by the foundation of Kimberley, which has since become one of the most important towns in the province. The mining of diamonds, which was at first largely carried on by individual diggers, has since been concentrated in the hands of a powerful company which controls the entire output of the Kimberley diamond fields, and consequently by far the largest part of the world's output, and in 1912 produced 2,325,549 carats, valued at \$30,150,000. The copper mines are mostly located in Namaqualand, and the ore found is of a very rich kind, yielding a percentage of from 32 to 36, but the output is comparatively small, amounting to 16,951 short tons in 1912. The same may be said of coal, which occurs almost everywhere, but is principally mined in the Stormberg Mountain Range and is used by the state railways; in 1912, 74,701 tons were produced. Gold, iron, lead, and salt have been found in small quantities in the Knysna district, at the southern end of the province. Outside of mining, the industries of the province are as yet of very little importance and are chiefly confined to the production of wool, ostrich feathers, mohair, hides, skins, flour, tobacco. The value of these products in 1911 amounted to \$36,166,500.

Agriculture. Both by the quality of its soil and its climatic conditions, Cape of Good Hope is better adapted for grazing than for the raising of grain. Wheat, oats, barley, corn, and other grains are raised in quantities hardly sufficient to meet the domestic demand. The rearing of cattle, sheep, goats, and ostriches is carried on very extensively, many of the sheep farms ranging in size from 3000 to 15,000 acres. In 1911 the live stock of the province comprised 2,715,330 head of cattle, 333,962 horses, 47,059 mules, 191,086 asses, 17,134,513 sheep, 7,953,414 Angora and other goats, and 728,087 ostriches.

Transportation and Communication. Owing to the deficiency of navigable waterways, the transportation problem very early attracted the attention of the colonial administration. The first railway line was constructed in 1859, 58 miles long, connecting Cape Town with Wellington. The main object was to connect the most important ports with the interior, and lines were started from East London, Port Elizabeth, and Cape Town in a northern direction. The opening of the diamond fields of the colony and the gold fields of the Transvaal gave a new impetus to railway building. Cape Town has been connected with Kimberley since 1885 and with Johannesburg since 1892. In 1894 the Cape Town line was extended to Mafeking, and since then through Southern and Northern Rhodesia, 376 miles beyond the Victoria Falls on the Zambezi River, to be extended ultimately to the southern end of Lake Tanganyika. Of the total mileage in operation in 1912 the government owned 3492 miles, and 500 miles were owned by private companies. The total capital expenditure of the state lines up to the end of 1912 was \$386,261,000. In 1912 the government owned 8731 miles of telegraph lines, and the mileage used for telephones was 7845.

Commerce. The commerce is very extensive in proportion to the population of the country, and in 1910 it amounted to \$342,818,000. The imports (including specie) rose from about \$46,000,000 in 1890 to over \$97,335,000 in 1905, and

the exports from about \$81,000,000 to over \$160,598,000. The imports in 1910, including specie, but excluding interstate trade, amounted to \$99,066,000, and the exports to \$243,752,000. While imports were not affected during the South African War (1899-1902), exports were greatly diminished; but there was an enormous expansion of imports during 1902 and 1903, the years immediately following the conclusion of the war, due to the importation of capital for the reopening of the mines and other industries. The principal imports are textiles, leather, food-stuffs, explosives, hardware, and machinery. The exports consist chiefly of gold, diamonds, copper ore, wool, ostrich feathers, hair, and hides. Nearly two-thirds of the imports come from Great Britain, and nearly the entire amount of exports goes there. The trade with the United States has increased considerably. During the year 1910 imports from the United States amounted to \$6,935,000, mostly food-stuffs, agricultural implements, and machinery. The shipping in foreign trade for 1910 amounted to 1,961,899 tons entered, and 1,808,553 tons cleared.

Government. During the first 30 years of the British occupation (1806-35) the Cape was administered from London as a crown colony. In 1835 a legislative council was established, consisting of six officials and six nominees of the crown. The introduction of parliamentary institutions was accomplished in 1854, and it was only after 1872 that the colony enjoyed a responsible government similar in all essentials to that of the mother country. At the head of the administration was the governor, who was also high commissioner for the British possessions in South Africa. He was appointed by the crown and assisted by a responsible cabinet. The Parliament consisted of two houses, the Legislative Council and the House of Assembly, which met at Cape Town, the capital. On the 31st of May, 1910, the colony was merged in the Union of South Africa, thereafter forming an original province of the Union. (See UNION OF SOUTH AFRICA.) In the province there is an administrator appointed by the governor-general for five years, and a provincial council of 51, elected for three years, the council having an executive committee of four, the administrator to preside at its meetings. Members of the provincial council are elected on the same system as members of the Parliament, but the restriction as to European descent does not apply. The law of the colony is the Roman-Dutch law modified in accordance with the local requirements and supplemented by special legislative acts. In cases where there is no provision in the Roman-Dutch code, the English law is followed. The highest local judicial authority is the court at Cape Town, consisting of the judge president and four puisne judges. In the separate divisions and towns justice is administered by resident magistrates, while in the outlying villages the same function is performed by periodical courts and justices of the peace. The central government is represented in each division and district by a civil commissioner or magistrate, whose functions include the collection of revenues and administration of justice. There are also divisional councils elected by local ratepayers, and most of the municipalities have municipal councils. According to the new Defence Act of 1912, service is compulsory on all citizens, but only a proportion of young men

will be enrolled annually. (See UNION OF SOUTH AFRICA.) There are a number of naval fortifications, and a strong British fleet is maintained at Simon's Bay. The capital of the province is Cape Town (q.v.). Principal ports and towns are Port Elizabeth, East London, Graham's Town, Kimberley, and Paarl.

Finance. The revenue is obtained chiefly from customs duties, licenses, public domains, and services rendered by the natives. In the fiscal year 1904 the revenue amounted to \$48,936,000, more than one-half consisting of "services rendered," and the expenditures over \$70,825,000. In 1905 the revenue amounted to about \$67,431,000, and the expenditure \$53,117,000. For 1906 they were estimated at \$43,201,000 and \$42,948,000 respectively. Since May 30, 1910, the revenue and expenditure for the province have not been shown separately. The ordinary public revenue for 11 months ended May 30, 1910, was \$37,702,390; expenditure, \$39,329,284. The indebtedness of the colony is very great when compared with the population, amounting on May 30, 1910, to over \$234,704,296. In addition to this amount there are treasury and deficiency bills or notes outstanding of \$21,048,313. The larger part, however, represents expenditures on public works.

Education in the province is assisted by the government and is not compulsory. Even among the Europeans illiteracy prevails to a considerable extent. The Department of Public Instruction is under the direction of the superintendent general, who has charge of the distribution of grants, while the inspection of the schools is conducted by deputy inspectors. In 1911 the number of scholars who attended school was 208,523. The proportion of those who could neither read nor write, of the white population, was 22.37 per cent, and for the population other than white, 85.75 per cent. At the head of the educational institutions is the University of the Cape of Good Hope, which is an examining university merely. There are a number of colleges.

Population. The population of the province in 1891 was 1,766,040; in 1904, 2,409,804; and in 1911, 2,564,965, of which 582,377 were white, and the rest is made up of Malays, Hottentots, Kaffirs, Bechuanas, and mixed races. The European population is mostly of English extraction. The descendants of the Dutch settlers are known as Afrikaners. The majority of the people belong to different Protestant denominations; 25,041 are Roman Catholics, 22,517 Mohammedans, and 14,617 Jews; no religion (so stated), 33,091.

History. It was towards the end of the fifteenth century that Dias, a Portuguese navigator, doubled the Cape of Good Hope, preparing the way for Vasco da Gama, who opened the sea route to India in 1497-98. The thriving trade in that quarter attracted both English and Dutch merchants, but, although their ships found frequent shelter in the bays of the coast of this region, it was not till the middle of the seventeenth century that an attempt was made permanently to occupy the country. In 1652 the Dutch East India Company sent out an expedition which landed in Table Bay and took possession of the region and set about converting it into a habitable land. Slowly the development went on, Dutch colonists and French Huguenots, fleeing from religious persecution, taking up their abodes there. During the eighteenth century the stream of immigration grew larger,

the Dutch scattering over a considerable area, busying themselves now with subduing the wilderness, now the aborigines. At the end of the century there were at the Cape about 27,000 souls of European descent and a slightly larger number of slaves. In January, 1806, for the second time during the wars against Napoleon, an English force captured Cape Colony, stipulating that the "burghers and inhabitants should preserve all the rights and privileges hitherto enjoyed by them." Since that date the Cape has been a colony of Great Britain, though not formally recognized as such until the Peace of 1815. During the ensuing 60 years the history of the colony was made up of chapters of war with the Kaffirs and other tribes, and of conflict with the Dutch inhabitants, who felt the rule of England to be oppressive. There occurred during these years the famous "treks" of the Dutch burghers into the wilderness. (See ORANGE RIVER PROVINCE; TRANSVAAL PROVINCE.) In 1853 parliamentary government was introduced, and a great increase of population followed the discovery of diamonds at Kimberley in 1867-69. Cecil Rhodes (q.v.), who was Premier from 1890 to 1895, had a leading hand in the causes that led to the South African War (q.v.). The colony was invaded in 1901 by Boer commanders, who were joined by large numbers of sympathizers. Martial law was declared in the affected districts, and the loyalists agitated for the suspension of the constitution. Peace was followed by the disfranchisement of large numbers of Dutch citizens. Dr. Jameson of raid fame was made Premier in 1904, and a redistribution of electorates threw the controlling influence from the Afrikaner Bund (q.v.) to the loyalist Progressives, but the Amnesty Act of 1906 again altered the situation and led to a Bund victory in 1908. In 1910 a movement which had been initiated by Dr. Jameson in 1907 culminated in the Union of South Africa, into which the colony entered as the chief state. For the course of events since that date, see UNION OF SOUTH AFRICA.

Bibliography. Wilmot, *Geography of the Cape Colony* (London, 1882); Gresswell, *Our South African Empire* (ib., 1885); id., *Geography of Africa South of the Zambesi* (ib., 1892); Churchill, *Men, Mines, and Animals in South Africa* (ib., 1892); Wallace, *Farming Industries of Cape Colony* (ib., 1896); *Illustrated Official Handbook of Cape Colony and South Africa* (ib., 1896); Theal, *History of South Africa* (ib., 1889-93; new ed., 3 vols., 1903-04); Bryce, *Impressions of South Africa* (ib., 1897); Trotter, *Old Cape Colony* (ib., 1903); Gibbons, *Africa from South to North* (ib., 1904); Stow, *The Native Races of South Africa* (ib., 1905); Colquhoun, *The Afrikaner Land* (ib., 1906).

CAPE ORTEGAL, or 'tá-gál'. A northern extremity of Spain, projecting on the northwest coast into the Bay of Biscay in lat. 43° 47' N. and long. 7° 56' W., on a rugged and barren coast (Map: Spain, A 1).

CAPE PALINURO. See PALINURO.

CAPE PALMAS. The southernmost extremity of Liberia, Africa, in lat. 4° 22' N. and long. 7° 44' W., and marking the point at which the Maryland colony of free colored emigrants settled in 1834 (Map: Africa, D 4).

CAPE PIGEON, or CAPE PETREL. The pin-tado petrel, a large Antarctic petrel (*Daption capensis*) somewhat resembling a pigeon, common in large numbers about the Cape of Good

Hope, and of great interest to voyagers. See PETREL.

CAPE POGE, pōg. The extreme northeast point of the Martha's Vineyard Island group, and the north extremity of the east strip of Chappaquiddick Island (Map: Massachusetts, G 5). Cape Poge lighthouse is in lat. $41^{\circ} 25' N.$ and long. $70^{\circ} 27' W.$ The light flashes white and red, every third flash red, with five seconds' interval between flashes. It is $53\frac{1}{4}$ feet above sea level.

CAPE PRINCE OF WALES. The west point of the mainland of Alaska and of the American continent, opposite East Cape in Siberia. Bering Strait between the two is the narrowest water between America and Asia (Map: Alaska, B 2). The cape is slightly south of the Arctic Circle. It terminates in a bold bluff, north of which are dangerous shoals.

CAPER (Fr. *capre*, Lat. *capparis*, Gk. *κάρπαις*, *kapparis*). The pickled flower bud of the caper bush (*Capparis spinosa*). It has an agreeable pungency of taste, with a slight bitterness, and has long been in very general use as a condiment and ingredient of sauces. It possesses medicinal properties, being an antiscorbutic, stimulant, and laxative. It is of a grayish-green color, to improve which copper is sometimes used. The caper bush is a native of the Mediterranean countries. It is extensively cultivated in some parts of the south of France and in Italy, but most of all in Sicily. It succeeds in the open air even at Paris, but in Great Britain it requires the aid of artificial heat. In the northern United States capers are propagated by cuttings in greenhouses, but they are grown from seed in the South. It is a trailing, rambling shrub, loving dry places and often growing on rocks or walls. It begins to flower early in summer, and continues flowering till winter. The buds are gathered every morning, and are immediately put into vinegar and salt. At the end of the season they are sorted according to their size and color, the greenest and least expanded being the best, and are again put into vinegar, the finest being sent to the market in bottles, the coarser, in small barrels. The fruit, which is a small berry, is also pickled in the south of Italy. The flower buds of the caper of Mount Sinai (*Capparis sinaica*) are pickled like those of the common species; the seeds are also pickled and are called by a name signifying mountain pepper. The fruit of *Capparis aphylla* is made into a pickle in India. The species of *Capparis* number about 150, and are found in most tropical and subtropical regions, except North America. Various substitutes for caper are sometimes used, as the flower buds of the marsh marigold (*Caltha palustris*), those of the Indian cress, or so-called nasturtium (*Tropæolum majus*), and those of the bean caper (*Zygophyllum fabago*) and of the bladdernut (*Staphylea trifolia*). The caper tree (*Capparis jamaicensis*), which grows throughout the West Indies, in South America, and in Florida, is a small tree with a very hard wood. The caper of England is a spurge, belonging to the genus *Euphorbia*. It has no relationship with the foregoing. For illustration, see Plate of CAMELIA, ETC.

CAPE RACE. A cape forming the southeast extremity of Newfoundland, in lat. $46^{\circ} 40' N.$ and long. $53^{\circ} 4' W.$ (Map: Newfoundland, G 6). It has a lighthouse, with light 180 feet above the water. This is an important beacon for the

transatlantic vessels passing between Europe and northern North America.

CAPERCAILLIE, kā'pēr-kāl'yī, or **CAPERCAILLIE**, kā'pēr-kāl'zī or -kāl'yī (of uncertain etymology, possibly from Gael. *cabhar*, hawk + *coille*, wood; according to some, from Gael. *capull-coille*, from *capull*, mare, Lat. *caballus*, horse + *coille*, or from Gael. *cabhar* + *coileach*, wood), WOOD GROUSE, or COCK OF THE WOODS. A European grouse (*Tetrao urogallus*), almost equal in size to the turkey. The adult male is brownish black, minutely freckled with grayish white, and with lighter brown; quill feathers, dark brown; tail feathers, nearly black; chest, a shining dark green; there is a small scarlet patch of naked skin above the eye, and the bill is whitish. The general color of the smaller female and of young males is dark brown, freckled with yellowish brown; the front of the neck and the chest are yellowish chestnut, and the feathers of the under parts are generally edged with white; the feet are feathered to the toes. It is an inhabitant of pine woods; feeds on berries, seeds, worms, insects, etc., and on the young shoots of the pine, birch, and other trees. The female makes her nest on the ground, and lays from six to twelve eggs, of a pale reddish or yellowish brown, spotted with other shades of brown, and more than two inches long. Like the blackcock, the capercaillie is polygamous, and is noted for its extraordinary "dances" in courtship. In spring, on the approach of the breeding season, the cock "mounts to the top-most boughs of a tall tree, whence he challenges all comers by extraordinary sounds and gestures, while the hens . . . timidly abide below the result of the frequent duels, patiently submitting themselves to the victor." During these antics the bird seems oblivious to all else, and may easily be approached. The capercaillie is found on the pine-covered mountains of all parts of Europe and a related species (*Tetrao urogalloides*) is abundant in the northern parts of Asia. It once lived in Scotland and Ireland, where it was completely extirpated towards the end of the eighteenth century, but has been restored to the forests of northern Scotland by stock imported from Scandinavia. The capercaillie is readily domesticated, if allowed the range of a space containing a few pine trees, and is much esteemed for the table. It is hunted with the aid of dogs, who "tree" the birds, when they are shot down. Consult: Lloyd, *Game Birds of Sweden and Norway* (London, 1867); Morris, *British Game Birds* (London, 1891); Darwin, *Descent of Man* (London, 2d ed., 1874); and especially Millais, *The Natural History of British Game Birds* (London, 1909). See Plate of GROUSE, ETC.

CAPERN, EDWARD (1819-94). An English poet, known as the "Rural Postman of Bideford." He was born at Tiverton, Devonshire, was a lace maker until his sight failed in 1847, and then was a postman at Bideford until, through Landor's influence, he obtained a pension from the English civil list. His productions, which are marked by freshness and melody, include: *Poems by the Bideford Rural Postman* (1856; often republished); *Ballads and Songs* (1858); *Wayside Warbles* (1865; 2d ed. 1870); *Sun-Gleams and Shadow-Pearls* (1881); and *The Devonshire Melodist*, which includes the author's own music to some of his songs.

CAPERNAUM (Gk. *Καπερναούμ*, *Kapernaoum* or *Καφαρναούμ*, *Kapharnaoum*, Heb. *Καφαρ* *Na-*

hum, village of Nahum). A town of Galilee frequently mentioned in the gospel history. When Jesus began his Galilean ministry He made it his home (Matt. iv. 13). In fact, so closely did He identify himself with it that it is called "his own city" (Matt. ix. 1). Though it was the scene of many of his miracles and wonderful discourses, it remained spiritually unimpaired by his work, and with Chorazin and Bethsaida had its ruin foretold by Jesus (Matt. xi. 20-24). In the gospel times it was a place of considerable importance. It was the seat of a Roman garrison, whose commander had built the people a synagogue (Luke vii. 1-10), and the residence of a representative of Herod Antipas (John iv. 46). It was also a customs station, from which Matthew was called to be an Apostle (Matt. ix. 9). There has been much discussion as to its site, as it is mentioned only in the New Testament. Two localities are favored by authorities—*Tell Hūm* and *Khān Mīnyeh*, both on the northwest coast of the Sea of Galilee, not far distant from each other. At *Tell Hūm* many extensive ruins have been found, some of which have been supposed to be those of the synagogue in which Jesus taught. The opinion of scholars is increasingly favorable to this site, in view of the fact that the name Capernaum was not confined to the city but was applied to the general district surrounding it, which would bring the place into that connection with the plain of Gennesaret which is implied in the New Testament notices (cf. John vi. 17 with Mark vi. 53) and in statements by Josephus (Wars, iii. 10: 8). Consult, in behalf of the claims of *Tell Hūm*, Buhl, *Die Geographie des alten Palästina* (1896), and Sanday, in *Journal of Theological Studies*, pp. 42 ff. (1904); for *Khān Mīnyeh*, G. A. Smith, *The Historical Geography of the Holy Land* (1895).

CAPERS, WILLIAM (1790-1855). An American clergyman, Bishop of the Methodist Episcopal church, South. He was born in South Carolina, studied in South Carolina College, became an itinerant preacher, and was a missionary among the Indians in Georgia (1821-24). He was for four years presiding elder in Charleston, where he edited for a short time the *Wesleyan Journal* (founded 1825; in 1826 merged in the *New York Christian Advocate*). He did home missionary work, especially among the negroes. In 1837 he established and edited the *Southern Christian Advocate*. At the first general conference of the Methodist Episcopal church, South, in 1846, he was chosen Bishop. Consult the autobiography, with a memoir by Wightman (Nashville, Tenn., 1858).

CAPE SABLE. The southernmost point of the mainland of Florida, and of the mainland of the United States as well (Map: Florida, C 4). It is in lat. 25° 8' N. and long. 81° 7' W., and projects slightly into the Bay of Florida.

CAPE SABLE. The southernmost point of Cape Sable Island, off the south coast of Nova Scotia, Canada (Map: Nova Scotia, D 5).

CAPE SAINT GEORGE. A cape on the west end of St. George Island, off the west coast of Florida, about 10 miles south of Apalachicola, Franklin County (Map: Florida, D 2). The Cape St. George lighthouse is in lat. 29° 35' N. and long. 85° 2' W., about 3½ miles east of the west pass entrance to Apalachicola Bay on Flag Island. The light is 72 feet above sea level, and is fixed white.

CAPE SAINT VIN'CENT. A headland at the southwest extremity of Portugal in about

lat. 37° N. and long. 9° W. (Map: Portugal, A 4). Off this cape the British, under Admiral Jervis, defeated a Spanish fleet Feb. 14, 1797.

CAPE SAN BLAS, *sān blās'*. A cape on the west coast of Florida, in Calhoun County, the southern point of the neck of land which separates San Blas Bay from St. Joseph's Bay (Map: Florida, C 2). It is about 20 miles nearly west of Apalachicola. Cape San Blas lighthouse is at the southernmost point of the cape in lat. 29° 40' N. and long. 85° 21' W. The light is 98 feet above the sea level and flashes alternately red and white, the interval between flashes being 30 seconds.

CAPE SAN LUCAS, *lū'skas*. The southernmost point of the peninsula of Lower California, Mexico, in about lat. 22° 50' N. and long. 109° 54' W. (Map: Mexico, D 6).

CAPE SAN ROQUE, *sān rō'kā*. A promontory on the extreme northeast coast of Brazil, situated in lat. 5° 30' S. and long. 35° 14' W. (Map: Brazil, K 5).

CAPE SPARTIVENTO (ancient *Herculis Promontorium*). The southeast promontory of Italy, in lat. 37° 57' N., long. 16° 5' E., once regarded as the southernmost point of Italy (Map: Italy, L 10).

CAPET, HUGH. See HUGH CAPET.

CAPETIAN (*ká-pē'shan*) **DYNASTY** (Fr. *Capétiens*). The royal line in France from 987 to 1328. On the death of Louis V, the last of the Carolingians, in 987, Hugh Capet was elected King by the aid of the clergy. From that time, for 341 years, all of the rulers of France belonged to the same family, and in almost every instance the son succeeded the father. The kings of the Capetian dynasty strengthened greatly the royal power in France by insisting upon the principles of heredity, primogeniture, and the indivisibility of the crownlands, which they strove to increase. In the same year that he was crowned, Hugh caused his son Robert to be elected as his associate, and his practice was followed until 1179, when Philip Augustus was crowned as his father's associate. By that time the hereditary principle was so firmly established that it was no longer necessary for the son to be chosen during his father's lifetime. The Capetians broke entirely away from the Merovingian and Carolingian custom of dividing the kingdom among all the sons. The eldest son alone became King and received the royal domain, except for appanages, and in this way the kingdom was saved from the divisions which had weakened the Carolingian Empire. The Capetians also by a forced interpretation of the Salic Law excluded females from the succession. (See HUNDRED YEARS' WAR.) Most of the Capetians endeavored to add to the royal domain by the incorporation of additional fiefs, large or small, and thus gradually obtained the direct lordship over almost all of France. This process was very rapid under Louis VI, Philip Augustus, Louis IX, and Philip IV. The Capetian dynasty was succeeded by the Valois dynasty.

The rulers of the line were: Hugh Capet, 987-996; Robert II, 996-1031; Henry I, 1031-60; Philip I, 1060-1108; Louis VI, 1108-1137; Louis VII, 1137-80; Philip II Augustus, 1180-1223; Louis VIII, 1223-26; Louis IX, 1226-70; Philip III, 1270-85; Philip IV, 1285-1314; Louis X, 1314-16; Philip V, 1316-22; Charles IV, 1322-28.

CAPE TOWN. The capital of the Province of the Cape of Good Hope and the foremost

seaport of British South Africa (Map: Cape Colony, F 8). It is situated on Table Bay, on a slope of Table Mountain, in lat. 33° 56' S. and long. 18° 28' E. It is well built with fine streets and squares and all the improvements of a modern city, including electric lighting. The public buildings as well as the private residences are in modern European style, and the entire aspect of the place, with the exception of the heterogeneous crowds in the streets, is essentially European. The climate is comparatively moderate and healthful, and the water supply excellent. There are a cathedral, several churches of different denominations, a synagogue, and several mosques. The houses of Parliament, the municipal buildings (completed in 1906), and those of the Supreme Court, and the banks are among the chief secular edifices. Cape Town has several colleges and an examining university, the South African Museum, a library, and an observatory, besides a number of schools for elementary and secondary education. The harbor has been improved by a breakwater of gigantic proportions and is divided into several parts, of which the inner harbor is sufficiently deep for the heaviest vessels. The entrance to the harbor is defended by a castle which is the headquarters of the military forces of the colony. Cape Town has an American consulate. The tonnage landed here in 1910 was 688,250; 1911, 732,732; shipped, 1910, 156,087; 1911, 262,630. The exports of merchandise to the United States in 1911 were valued at \$862,135.

Cape Town is the seat of a Catholic and an Anglican bishop, and of a number of consular representatives, including one from the United States. Pop. (white), 1904, 44,203; 1911 (white), 29,863; (white and colored), 67,170; (with suburbs), 149,461. Cape Town was founded in 1652 by the Dutch, in whose possession it remained until 1806, when it was taken possession of by England.

CAPE VERDE, vürd. The most westerly headland of Africa, in Senegal, jutting out into the Atlantic Ocean, nearly midway between the rivers Gambia and Senegal, in lat. 14° 43' N., long. 17° 34' W. (Map: Africa, C 3). It was discovered by the Portuguese about 1445, and is said to have derived its name from a group of gigantic baobab trees which adorn its summit and forms a green spot on the white coast.

CAPE VERDE ISLANDS (*Ilhas de Cabo Verde*). A group of islands in the Atlantic Ocean, west of Africa, belonging to Portugal, situated between lat. 14° 45' and 17° 19' N., and between long. 22° 45' and 25° 25' W. (Map: Africa, B 3). The ten principal islands are Santiago (São Thiago), the largest and most important, Fogo, Brava, Maio, Boavista, São Nicolão, Santo Antão, São Vicente, Santa Luzia, and Sal. Including the four uninhabited islets, the total area of the group is officially given as 3927.5 square kilometers (1516 square miles). The islands are all very mountainous, and owe their origin to the action of submarine volcanoes. The only active volcano is situated on the island of Fogo and has an altitude of 9744 feet. The climate is hot and unhealthy, and the droughts which occasionally visit the islands are frequently followed by famines. Sugar, coffee, tobacco, indigo, and millet are cultivated, and some southern fruits are successfully grown. The physic nut (*Jatropha curcas*) is also produced for export. Several of the Euro-

pean domestic animals thrive well. Marine turtles abound. Great quantities of salt formed by solar evaporation are obtained from the lagoons on the shores, especially on the island of Sal. The total imports and exports for the year 1909 were valued at 1,909,634 and 235,894 milreis respectively. The exports consist of raw products, coffee, hides, salt, sugar, fish, etc.; while the imports include coal and all kinds of manufactured articles. The chief ports are Praia, the capital, on the island of Santiago, and Porto Grande, which has the best harbor in the whole group, on the island of São Vicente. The group is administered by a governor. The population was 142,552 in 1910 (4718 whites, 87,249 colored, 50,585 negroes). The islands were discovered in 1441 by the Genoese seafarers Antonio and Bartolomeo di Nolli, and were annexed to Portugal in 1456. Consult: Ellis, *West African Islands* (London, 1885); Fea, *Delle Isole del Capo Verde* (Rome, 1899); Lima, "Rapport sur les îles du Cap Vert," in *Recueil consulaire*, vol. cx (Brussels, 1900).

CAPE VINCENT. A village and port of entry in Jefferson Co., N. Y., 25 miles west by north of Watertown, on the St. Lawrence River, and on the New York Central and Hudson River Railroad (Map: New York, D 1). Steamers ply between this place and Kingston, Ontario. It is a popular summer resort, and contains a United States fish hatchery, a receiving station and storage plant for wood pulp, creamery, split-pea manufactory, and a government customs office. The water works and electric light plant are owned by the municipality. The value of its exports in 1912 was \$217,799, and its imports, \$303,486. Pop., 1900, 1310; 1910, 1155.

CAPE WRATH. The northwest extremity of Scotland, in Sutherlandshire, a pyramidal promontory 523 feet high (Map: Scotland, C 1). It is noted for its wildness and grandeur, and projects into the Atlantic in lat. 58° 38' N. and long. 4° 58' 5" W. Its lighthouse is visible 27 miles.

CAP'GRAVE, JOHN (1393-1464). An English historian and theologian. He was born at Lynn, was ordained a priest about 1418, and was afterward made provincial of the Augustinian Order in England. His works include Latin commentaries on the Bible; *A Life of Saint Katharine*, in English verse; *A Chronicle of England from the Creation to A.D. 1417*; *A Guide to the Antiquities of Rome*; and *De Illustribus Henricis*. The last work and the chronicle were edited by F. C. Hingeston, in the *Rolls Series* (London, 1858).

CAPHTOR. The original home of the Philistines, Deut. ii. 23, Amos ix. 7, who are therefore called Caphtorim, Gen. x. 14, Deut. ii. 23. Crete is meant. Recent discoveries render this identification practically certain. The Chere-thites (q.v.) are so constantly coupled with the Philistines, or the Pelethites, that they would seem to form a branch of the same family, and there is no good reason to doubt that the Chere-thites are Cretans. The Zeus Cretagenes in Gaza also points to a connection of the Philistines with Crete. Caphtor is found in the form of Kptar, as the name of a people in an inscription at Ombos. The Eteocretans were called Kafti by the Egyptians. (See also JAPHETH.) Even if the original text in Jer. xlvii. 4 did not have Caphtor, as it is lacking in the Greek version, the Hebrew recension refers to Crete.

Consult: Hall, "Kéttiu and the Peoples of the Sea," in *Annual of the British School*, vol. viii, pp. 157 ff. and cf. vol. x, p. 154, vol. xvi, p. 254; W. M. Müller, in *Mitteilungen der vorderasiatischen Gesellschaft* (1900): Ed. Meyer, *Geschichte des Altertums*, i, 2, pp. 793 ff. (3d ed., 1913).

CAPIAS (Lat., you may take, or seize, from *capere*, to take). A writ in a civil action ordering the officer to whom it is directed to seize and take into custody the person of the defendant. Strictly speaking, a *capias* issues only in a common-law proceeding, as distinguished from one in equity. The abolition of imprisonment for debt has greatly diminished the number of cases in which the defendant may be arrested in a civil action, but the right of an arrest in almost all, if not all, of the States still exists where a willful and malicious injury or a fraudulent concealment of property, or proposed evasion of the jurisdiction of the court, is alleged. Usually an affidavit must be presented on which to base the application for a writ of *capias*. Of the several kinds of *capias* the most common are:

1. The *capias ad respondendum*, which directs the sheriff to arrest the defendant and hold him until a certain day on which he is to be brought before the court. Formerly every action at law was instituted by this process: now the cases in which it is employed are rare and are strictly limited and defined by statute. When used alone the word *capias* usually refers to this form of writ. 2. *Capias ad satisfaciendum*; a writ directing the officer to seize the party to the suit named (this may possibly be a plaintiff, though usually a defendant) and bring his body on a fixed day before the court to satisfy a judgment already issued. It will be seen that this was at the end, as the former writ described was at the beginning, of lawsuits under the common law; though the use of this writ is now much restricted by statutory limitations, it is still a common-law process: it is familiarly known in the legal profession by the abbreviation *ca. sa*. 3. *Testatum capias*, a supplementary or second writ, issued when an ordinary *capias* has been placed in the hands of the sheriff and has been returned with the indorsement that the defendant could not be found. In such cases the new writ may be issued after a lapse of time without the introduction of other proof than the production of the original. None of these writs are common in England or in the United States at present. See **ARREST**; **ATTACHMENT**; **EXECUTION**; **HABEAS CORPUS**.

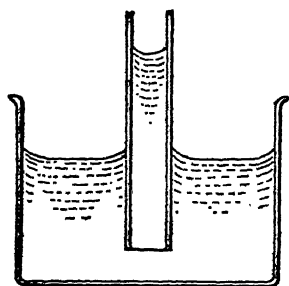
CAPILLARIES (Lat. *capillaris*, belonging to the hair, *capillus*, hair, from *caput*, head). The tubes which convey the blood from the left side of the heart to the various parts of the body are termed arteries, while those which return it to the right side of the heart, after it has discharged its various functions in the body, are known as veins. Capillaries are the minute vessels which form the connection between the terminal branches of the arteries and the commencements of the trunks of the veins. These little vessels vary in diameter from $\frac{1}{1000}$ to $\frac{1}{500}$ of an inch; they are smallest in the brain and largest in the marrow of bone. Their arrangement also varies. In some cases, as in muscular tissue, they run parallel to one another; in other cases, as around fat cells, they have a spherical arrangement, and in the skin and in parts of the intestines they form loops. The walls of capillaries are exceedingly thin and

readily permeable; they are surrounded by lymph, and there is a constant interchange of material between the blood plasma within the capillaries and the lymph outside. It is thus that the processes of nutrition and elimination are carried on, and the necessary exchange of oxygen and carbonic acid takes place.

The circulation of the blood through the capillaries may be readily seen under the microscope in the web between the toes of the hind foot of the frog, in the tongue of that animal, in the tail or gills of the tadpole, in the wing of the bat, etc. See **BLEEDING**; **BLOOD VESSELS**; **DIGESTION**; **SECRETION**.

CAPILLARITY. That branch of physics which considers the properties of liquid surfaces. The fundamental property of such surfaces is their tendency to contract. This is shown by the fact that a liquid surface always assumes the smallest area compatible with the existing conditions. Thus falling drops of liquids are spherical; and it is known from geometry that the area of the surface of a sphere is less than that of any other solid of an equal volume. If a soap bubble is not detached from the pipe, it will contract when the mouth of the one who blows the bubble is removed. Again, it requires work to blow a bubble; and this proves that there is a force opposing the increase in area of the bubble. It should be noted that when a soap bubble is blown, it is not a question of *stretching* the surface, but of making more surface by forcing some of the liquid from the interior out to the surface. (The liquid film finally becomes so thin that this is impossible, and then the surface may be stretched.)

This contracting power of a liquid surface explains the phenomena observed when tubes of fine bore are partially lowered into a liquid. (The word "capillarity" is derived from this fact, because these tubes must be comparable with the size of a hair, the Latin word for which is *capillus*.) If the material of the tube is such that it is "wet" by the liquid, i.e., if when dipped into liquid and then withdrawn there is a liquid film sticking to it (e.g., glass and water), it will be observed that, if the tube is first immersed in the liquid and then placed vertical, only dipping into the surface, the level of the liquid in the tube is higher than that outside by an amount which varies inversely as the radius of the bore. The surface of water inside the tube is like the inside of the finger of a glove, being a lining of the upper portion of the tube and including the top of the liquid column. This surface contracts, rounding off the corners so as to be concave upward, and drawing the column of liquid up the tube, until stopped by the action of the gravity on the portion of liquid above the general level. Illustrations of this capillary action are given by the use of blotting



CAPILLARY ACTION BETWEEN GLASS AND WATER.

paper, the action of a lump of sugar on water, the action of wicks in lamps and candles, etc.

If, on the other hand, the solid is one which is not wet by the liquid (e.g., glass and mercury), the level of the liquid inside the tube will, under similar conditions, be lower than that of the level outside. In this case the surface of the liquid in the tube is like the outside of the finger of a glove; and, as it contracts, it rounds off the corners, makes the surface convex upward, and draws the level down. The depression will be found to vary inversely as the radius. The fact that the smaller the radius of a surface, so much the greater is the contracting force is shown also by another experiment; a tube for blowing soap bubbles is so made that two bubbles can be blown at one time on opposite ends of a connecting tube; if one bubble is blown larger than the other, and if the bubbles are then left to themselves, it will be observed that the smaller increases in size, blowing out the larger one. This proves that the pressure produced inside the smaller bubble by its contraction is greater than that in the larger. It is seen, therefore, that the pressure varies inversely as the radius; and to start a bubble *ab initio*, i.e., with a radius infinitely small, would require an infinitely great pressure. In fact, it is observed that bubbles of vapor in a boiling liquid or of gas in aerated liquids nearly always have a minute nucleus of dissolved gas to begin on. The presence of a solid with sharp points also facilitates the formation of bubbles, because the liquid surface can start around them. Similarly, the pressure inside a liquid drop varies inversely as the radius; and to start a drop from an infinitely small radius presupposes an infinite pressure. Thus drops of liquid are always condensed around some nucleus, such as a particle of dust or the points of a solid. Drops of rain have, in general, bits of dust inside; dew is formed on rough objects more quickly than on smooth ones, etc.

This contracting power of a liquid surface is greatly affected by the introduction of impurities into the surface and by changes in temperature. Soapy water has less contracting power than pure water; and the motions of bits of camphor or of sodium or potassium on the surface of water are explained by the unequal rates of pollution of the surface at various points of the solid and the consequent unequal alterations in the surface forces, which thus pull the solid bit around in a most random path. If the temperature is raised, the surface forces decrease, as is shown by the fact that the height to which water stands in a glass tube decreases as the temperature increases.

These contracting tendencies of a liquid surface are due to the action of the minute particles of the surface; there are evidently forces holding these particles together. The force acting across a line of unit length is called the "surface tension," and it may be proved that if there is a spherical surface of radius r , there will be a contracting pressure given by the formula

$$p = 2T/r,$$

where T is the surface tension of the liquid. Thus, to keep a soap bubble of radius r from contracting, it is necessary to blow into it with a pressure $4T/r$, because there are *two* contracting surfaces in a soap bubble. Further, if the liquid stands in a tube of small bore at a height h above the general level of the liquid, the hydro-

static pressure due to this height must be counterbalanced by the contracting pressure of the concave surface of the water in the tube. This hydrostatic pressure is dgh , where d is the density of the liquid and g is the acceleration of a falling body. (See HYDROSTATICS.) Hence,

$$\begin{aligned} dgh &= 2T/r \\ \text{or } h &= \frac{2T}{dgr}, \end{aligned}$$

where r is the radius of the tube *at the point at the top of the column of water*, because, strictly speaking, r is the radius of the spherical concave surface of the water, and this equals the radius of the tube at this point if the liquid wets the tube. Therefore it is entirely immaterial what the radius of the tube is at other points below; the height h remains the same.

For most interesting and instructive descriptions of capillary phenomena, consult Boys, *Soap Bubbles, and How to Blow Them* (New York, 1900; new ed., London, 1912). Consult also: Raleigh, "Investigations in Capillarity," in *London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 5th series, vol. xlviii, pp. 321-337 (London, 1896); id., on "Laplace's Theory of Capillarity," in his *Scientific Papers*, vol. ii, and various other essays in the same series (Cambridge, 1900 et seq.); Mensbrugghe, "Sur les phénomènes capillaires," in *Congrès international de physique, Rapports*, vol. i, pp. 487-511 (Paris, 1900).

CAPISTRANO, kă'pě-stră'nô, GIOVANNI (c.1386-1456). An Italian friar, commander against the Turks. He was born at Capistrano, in the Abruzzi. In his early manhood he pursued the practice of the civil and canon law in Naples. In 1416 Capistrano entered the Franciscan Order, and soon attained prominence through the fiery zeal he displayed against nonbelievers and heretics. He was sent, in 1450, as papal delegate to Germany to preach against the Hussites and to urge a crusade against the Turks, who threatened western Europe. While in Germany, he instigated a persecution against the Jews of Silesia. Having failed in his efforts to unite the German princes in a crusade against the Turks, he is said to have collected an army of 60,000 men, which he led into Hungary to the relief of Belgrade, then besieged by the Turks (1456). He led the inhabitants in three successful sorties, cross in hand. He died as a result of his exertions during the siege; he was beatified in 1690 and canonized in 1724 by Benedict XIII. See HUNYADY, JÁNOS. Consult Jacob, *Johannes von Capistrano* (2 vols., Breslau, 1903-05).

CAPITAL (Lat. *capitellum*, dim. of *caput*, head). The head or top member of a column, pier, pilaster, etc., when treated as separate from the shaft. For the history and different types of the capital, see COLUMN; ORDERS OF ARCHITECTURE.

CAPITAL (Fr. *capital*, ML. *capitala*, from Lat. *capitalis*, pertaining to the head, from *caput*, head; for the origin of the meaning cf. *principal*, in the sense of capital). A stock or fund of wealth from which its owner expects to derive an income. As commonly used, the term "capital" is applicable only to wealth devoted to business purposes. Thus a man of affairs will place under the head of capital the land, buildings, stocks of raw materials, etc., through which he secures a money income. He will not describe as capital his dwelling and its accessories. This

distinction between wealth which yields a money income and wealth which yields its ultimate satisfactions directly to its owner has been rejected as fruitless by a school of modern economists, of whom Prof. Irving Fisher is the leading representative. Capital, according to this school, is the whole stock of wealth existing at a moment of time. It is to be contrasted with income, or the services derived from wealth through a period of time. It is to be noted that while this conception differs from that current among business men, it is essentially nothing more than a logical development of that conception.

In classical political economy the term "capital" designates, not the whole stock of wealth, but only such part of it as is itself the product of past industry and is employed as a means of further production of wealth. This excludes, on the one hand, finished goods in the possession of the ultimate consumer, and, on the other hand, productive goods not originating in human industry, such as land, ore deposits, etc. Income from capital, in this narrow sense of the term, was designated "profit" (in the terminology of later classical writers, interest), while the income from natural resources was termed "rent." Capital in the classical sense is further differentiated as "fixed" and "circulating." Fixed capital, according to Mill, consists of all the more or less durable instruments of production, such as buildings, machinery, etc. Circulating capital consists of instruments capable of only a single service, such as raw materials, fuel, and also the funds employed in the payment of wages. The distinction was regarded by the classical economists as of great social importance, since they believed that aggregate wages were limited by the amount of circulating capital. (See *WAGES FUND*.) With the general recognition of the fact that the relation between capital and wages is far less simple than the classical economists supposed, the distinction between fixed and circulating capital has fallen into disuse. Some economists follow Professor Clark in substituting therefor the distinction between active capital—that which imparts utility, as a machine—and passive capital—that which has utilities imparted to it, as raw material.

A further distinction that has gained currency among economic writers is that between productive capital and acquisitive capital. Productive capital is a category of production as well as of distribution; acquisitive capital is a category of distribution alone. An example of the former is a machine or a stock of materials; examples of the latter are shares in the public debt, possession of monopoly powers, etc. Destruction of productive capital would result in reduction of the social income; destruction of acquisitive capital would merely change the distribution of social income.

Present-day adherents of the narrow classical definition of capital defend their position, not on grounds of abstract logic, but on grounds of social policy. The capital which is the result of past industry originates, in a sense, in abstinence. It is only because some persons are willing to forego present consumption that productive power is diverted from the making of enjoyment goods to the making of instruments for further production. Lands, ore deposits, etc., exist independently of human choices; buildings and machinery do not. So long as private enterprise prevails, the man who chooses to forego

present consumption in order to increase the productive equipment of society can demand and receive a reward in the shape of profit (interest). Abolition of such rewards would be tantamount to the destruction of the system of private enterprise. The rewards received by the private owners of land and other natural resources are in no sense a condition of the employment in industry of such resources. It is contended by many that all such rewards should be confiscated by the state. (See *SINGLE TAX*.) Others, less extreme, believe, nevertheless, that a distinction should be made between the two forms of profit-yielding wealth in the fiscal policy of the state. On such grounds many economists cling to the classical distinction between land and capital, in spite of its discrepancy with business usage.

Among socialistic writers the term "capital" is used to designate any form of wealth that yields an income independently of the exertions of the owner. An artisan's tools, a small proprietor's holding of land, are not capital in this sense. Capital, as a social category, comes into existence when one body of men own the means of production, while another body of men, possessing nothing but their physical and mental powers, utilize the means of production for the owner's benefit, receiving bare wages as their reward. In the socialistic view capital is essentially a private monopoly of the means of production, and the return to capital is the surplus remaining after the claims of the laborer have been met. It is usual to define these claims in terms of the minimum of subsistence. The general social system in which capital dominates is designated as "capitalism."

Capital in this sense of the term reached a considerable development in classical antiquity, but practically disappeared in western Europe with the breakdown of the Western Empire. It gradually reasserted itself with the commercial development following the Crusades and developed rapidly in the era opened by the discovery of America. The Industrial Revolution (q.v.) greatly extended the domination of capital. Survivals of an earlier order remain in limited fields, such as the peasant holding of land and the handicrafts; but these are in many instances indirectly dominated by capital. According to the socialistic doctrine of social evolution, the domination of capital will finally become universal. When this point has been reached, it is predicted by the Socialists, a revolution, either sudden and violent or gradual and peaceful, will occur, which will vest all the means of production in a coöperative commonwealth. Such an event would involve the disappearance of capital, as defined by the Socialists. See *SOCIALISM*.

For the classical economic doctrine of capital, consult Mill, J. S., *Principles of Political Economy* (first published London, 1848; many subsequent editions). For a critical discussion of the relation between capital and wages, consult Taussig, *Wages and Capital* (New York, 1899). The current economic conceptions of capital and its functions are best expounded in Böhm-Bawerk, *Capital and Interest* (London, 1890) and *Positive Theory of Capital* (London, 1891); Marshall, *Principles of Economics* (3d ed., London, 1895); Clark, *The Distribution of Wealth* (New York, 1899); Fetter, *The Principles of Economics* (New York, 1904); Fisher, *The Nature of Capital and Income* (New York, 1906).

For the socialistic conception of capital, consult Marx, *Das Kapital* (1867-95; most available Eng. trans., Chicago, 1908-09). For the development of capital as a social system, consult Hobson, *The Evolution of Modern Capitalism* (London, 1896), and Sombart, *Der moderne Kapitalismus* (Leipzig, 1902). See CAPITAL ACCOUNT; POLITICAL ECONOMY; INTEREST.

CAPITAL ACCOUNT. A statement of the amount and value of the property of an enterprise at a given moment of time. Such an account consists of two columns, representing assets and liabilities. In arriving at the capital balance all property owned is placed in the assets column, while all debts and obligations, including the claims of the owners upon the enterprise for sums invested and profits earned, are entered in the liabilities column.

The term "capital," as employed in capital accounts, may represent the actual net balance of property owned less obligations other than those to the owners of the enterprise; it may represent the sums originally invested; or it may represent the par value of outstanding shares, or even of outstanding shares plus shares authorized but not issued. The first sense is common in the case of the individual enterprise; the second in the case of partnerships. In the latter case the capital account contains separate entries for the sums contributed by the several partners. Capital is employed in the sense of capitalization, outstanding or authorized, in corporation accounts. In the course of time the net balance of property of the corporation inevitably ceases to correspond with the book capital. Gains which are capital in the broader sense of the term are carried on the books of the corporation as "surplus" or "undivided profits." A similar procedure is not uncommon in partnership accounts. See CAPITAL.

CAPITAL OFFENSE. In English and American law a criminal offense for which, on conviction, the penalty of death may be awarded. The number of such offenses was formerly very large, especially in England, where, in the eighteenth century, every felony, with the exception of petit larceny and mayhem (q.v.), was punishable with death. A series of legislative enactments dating from 1832 has gradually reduced the number of capital offenses in England to four (treason, willful murder, piracy, and the destruction or attempted destruction of royal arsenals, ships, etc.), and in the United States generally to two (treason and willful murder). In a few States, as in a few countries of western Europe, capital punishment has been wholly done away with. See CAPITAL PUNISHMENT, and consult the authorities there cited, especially Stephen, *History of the Criminal Law of England*, vol. i, p. 72, and Pollock and Maitland, *History of English Law*, vol. ii. chap. 8.

CAPITAL PUNISHMENT. Punishment by death. It is generally considered to be the severest penalty which the courts may prescribe, and the number of offenses for which it is inflicted is everywhere diminishing. Indeed, this extreme penalty, notwithstanding the practice of the world from the remotest times down to the present day, has frequently been opposed by philosophers and philanthropists upon religious and ethical grounds as well as upon those of expediency. Mr. Bentham points out that the death penalty naturally suggests itself in the infancy of a state as the best method of preventing crime, inasmuch as it extirpates the

criminals. Such Scripture passages as the words, "Whoso sheddeth man's blood, by man shall his blood be shed" (Gen. ix. 6), are urged in justification of the death penalty for murder. Beccaria, the first modern author of eminence to combat capital punishment, denies the right of government to take human life under any circumstances and maintains that it is a less efficacious method of deterring others than the continued example of a living culprit condemned to repair, by laboring as a slave, the injury he has done to society. The principles of punishment in general have been thus clearly stated by Plato (*Gorgias*, § 525): "Every one who undergoes punishment, if that punishment be rightly inflicted, ought either to be made better thereby and profit by it, or serve as an example to the rest of mankind, that others, seeing the sufferings he endures, may be brought by fear to amendment of life." The question arises, then, does capital punishment deter men from committing those crimes for which it is inflicted? This question cannot be answered conclusively, since in some cases the abolition of capital punishment has been followed by an increase in the more serious forms of crime, while in other cases a decrease has been established. In the United States, where murder is punished by death with comparative infrequency, the crime is far more common than in England, where conviction for murder is usually followed by execution. Death was in former times, in England, the ordinary punishment for all felonies. Blackstone refers to 160 offenses as punishable with death, some of them of a nature which appears to us trivial, e.g., cutting down a tree or personating a Greenwich pensioner. Thanks to the exertions of Sir Samuel Romilly, this severe criminal code gave way towards the end of the reign of George III to more humane conceptions. Since the Statute of 1861 there remain in England only four crimes punishable by death—setting fire to the royal dockyards or arsenals, piracy with violence, treason, and murder.

In William Penn's code of laws for Pennsylvania murder and treason were the only crimes punishable by death, while in the Colony of Massachusetts there were 12 capital offenses. In the United States each State has jurisdiction over its own territory, and the laws punishing crime differ in several respects. Capital punishment may be inflicted for treason, murder, arson, rape, piracy, robbery of the mails with jeopardy to the lives of persons in charge, rescue of a convict going to execution, burning a vessel of war, and corruptly destroying a private vessel. In Michigan, Wisconsin, Rhode Island, Maine, and Kansas capital punishment has been abolished. In Iowa the Legislature, having once abolished the death penalty, felt constrained by the alleged increase of crimes of violence to restore it. Capital punishment has, moreover, been done away with in Holland, Rumania, Italy, and Portugal, and since 1863 has been practically abandoned in Belgium. In Switzerland it was totally abolished in 1874, but owing to a marked increase in the number of murders, the cantons in 1879 recovered the right to reestablish it in their respective territories. Seven cantons again introduced it, although for a number of years no death sentence was passed. In the remaining 15 cantons, including more than four-fifths of the population, the death penalty remains totally abolished. In many European countries which still enforce this

penalty, only a very small per cent of those condemned are actually executed.

The method of execution is by hanging in Great Britain, Austria, Russia, and the great majority of commonwealths in the United States; by beheading in Germany and France; and in Spain by means of the garrote. Execution by electricity was introduced in New York by the law of June 4, 1888; it has been adopted in Massachusetts, and its adoption has been advocated in other States. In military law, owing to the necessity for enforcing strict discipline, capital punishment holds a more important place than in the ordinary criminal code. Consult: Copinger, *An Essay on the Abolition of Capital Punishment* (London, 1876); Moir, *Capital Punishment* (London, 1865); N. M. Curtis, *Capital Crimes* (New York, 1894); K. Olivecrona, *De la peine de mort* (Paris, 1893). See ELECTROCUTION; EXECUTION; GARROTE; GUILLOTINE; HANGING; PENOLOGY; PUNISHMENT.

CAPITALS. The name applied to letters of larger size than the smaller and more usual characters of the same value in a font of type. Besides differing in size the larger sizes vary somewhat in form from the smaller letters, as in B, b; G, g; R, r. Capitals are normally used only at the beginning of words, although in subject headings or other special cases they may be employed throughout. Historically capitals are older than small letters. The immediate ancestors of the European alphabets, the Greek and Roman letters, are not distinguished as to the two classes of letters, all being written alike in large, or majuscule, script. Not only the Greek and Latin inscriptions, but the oldest manuscripts were thus prepared. The same statement holds true still of all Oriental alphabets, in which there is no difference between large and small letters. The large letters, or majuscules, of the Greek and Latin alphabet show two forms—an angular, in which the composing strokes of the letters are perpendicular to one another, and an uncial, or rounded form. The angular letters, or capitals proper, are more convenient for inscriptions, while the uncials are preferred on papyrus manuscripts and on soft materials. Gradually there were evolved from the majuscules the small letters, or minuscules. The majuscules, being ill adapted to cursive writing, yielded more and more to the minuscules, which are the sources not only of the small letters, but of the characters employed in handwriting. The use of minuscules gained ground but slowly, and the distinction between capitals and small letters was therefore comparatively late. Gradually, however, after minuscule writing had become the rule, it was thought necessary to denote the initial letters of words which were for some reason especially important, as at the beginning of a sentence, by the proper one of the old majuscules, while the rest of the word, and probably of the sentence, retained minuscule script. In manuscripts the capitals are often richly illuminated, gilded, or made the centre of a small design, frequently of excellent taste. There is, however, no strict rule as to their employment. The same uncertainty holds in early printed books. In the very oldest the capitals were often represented by a space which was afterward filled in by hand, as in the case of the manuscripts, and in later books the capital, though printed, was colored in imitation of the older usage. In the course of time the capitals, which originally had been used mainly, although not

exclusively, at the beginning of a section or paragraph, became more frequent. First the initial word of a sentence began with a large letter to call attention to its importance. Then words within the sentence were treated in the same way. It is noteworthy, however, that it was practically only nouns which were capitalized initially. This usage still survives in Danish and German, which uniformly begin each noun with a capital letter. German, however, is beginning to break away from this rule. English stands in this regard between German and French, with the other Romance languages, Russian, and the like. Each sentence and line of poetry, as well as the first word of a direct quotation, must begin with a capital. Proper names, and all words considered as belonging even temporarily to that category, are similarly treated. This includes names of churches, works of art, religious denominations, societies, and in sporadic instances nouns so strongly individualized as to be practically proper names, etc. Examples are, Church of the Transfiguration, Holbein's Head of a Young Man, Mennonites, Liberal League, War of the Rebellion. Titles of books capitalize important words, although library usage departs from this rule. Capitals are also used in names of months and days and the like, as well as in adjectives derived from proper names, in all of which cases French and its cognate languages write the small letter. All names of the Deity and frequently personal pronouns referring to God and Christ begin with capitals. In natural science the names of branches, orders, families, and genera are capitalized, and abbreviations of substantives, excepting weights, measures, and the names of law writs, are written in capital letters. In the use of capitals in English, as in other languages, the individual usage of different writers may vary slightly without seriously contravening the general rules governing the use of this class of letters. Consult E. M. Thompson, *Greek and Latin Palaeography* (Oxford, 1912), and Prou, *Manuel de paléographie latine* (3d ed., Paris, 1910).

CAPITAN, ká'pē-tān' (It., captain). A stock character in old Italian comedy, doubtless a development of the *miles gloriosus* of the Roman stage. He is a ludicrous blusterer, whose mouth reeks with blood and slaughter, but whose courage fails utterly when put to the test.

CAPITATION (Fr. *capitation*, ML. *capitatio*, numbering by heads, from *caput*, head). A tax levied on persons as individuals, either uniform for all citizens of a given age and sex group (poll taxes) or varying with specified social classes. Class capitation taxes, when differentiated according to fortune, become income taxes.

In France graduated capitation taxes were levied under Louis XIV and were intended to reach all classes in society. The privileged classes, however, succeeded eventually in escaping the tax, either through composition for a fixed capital sum or through control of the machinery of assessment and collection. The capitation taxes still resting upon the unprivileged were among the oppressions that gave rise to the Revolution. See TAXATION.

CAPITO, or **KÖPFEL**, kēp'fel, WOLFGANG FABRICIUS (1478-1541). A German Protestant reformer. He was born at Hagenau, Alsace, studied medicine, law, and theology at Freiburg, and became provost of the Benedictine abbey at

Bruchsal in 1512. In 1513 he was appointed preacher and professor of theology at Basel, and in 1523 provost of St. Thomas, Strassburg. Here he declared in favor of the Reformation and subsequently took a prominent part in the Synod of Bern (1532) and the Second Confession of Basel, or First Helvetic Confession. With Bucer he had drawn up in 1530 the *Confessio Tetrapolitana*, or Confession of the Four Cities (Strassburg, Constance, Memmingen, and London). He worked so earnestly for Christian unity that he was viewed with suspicion by his narrower Reformed brethren. Consult Baum, *Capito und Bucer* (Elberfeld, 1860).

CAPITOL (Lat. *Capitolium*, from *caput*, head). The citadel of ancient Rome and site of the national sanctuary, the temple of Jupiter, on the Mons Capitolinus the smallest but most famous of the hills on which Rome was built. The hill consists of two summits, of which the south was the Capitolium proper, containing the great temple of Jupiter, while the north was the citadel (*arx*), though the whole hill is often called Capitol. The natural abruptness of the sides was increased by artificial means, and the whole was strongly fortified. It does not seem to have been the site of the earliest settlement, but to have been chosen later as the common citadel for the Roman settlers of the Palatine and the Sabine settlers of the Quirinal, as the Forum was their common meeting place. The foundation of the great temple, consecrated to three gods, Jupiter Optimus Maximus, Juno, and Minerva, was attributed to Tarquinius Priscus, and its dedication to the consul Horatius (509 B.C.). For the foundations great substructures were needed, and in all later rebuildings the same general arrangement seems to have been retained. The building was nearly quadrangular, with three rows of columns in front and one at each side, but none in the rear; it consisted of three simple *cellæ*, one for each divinity. During the civil wars under Sulla the temple was burned. It was restored by Sulla and Catulus (83-69 B.C.), but was destroyed again during the Vitellian riots. It was rebuilt by Vespasian, after whose death it was again destroyed by fire, but was once more restored by Domitian. Domitian's structure lasted to a late period, but was finally so completely destroyed that little remains except the foundation walls. From that portion of the mount named the Tarpeian Rock (the southwest corner) state criminals were thrown down.

Besides the great temple of Jupiter, the most important structures on the Capitoline Mount were the temple of Jupiter Tonans, built by the Emperor Augustus, and the magnificent Tabularium, built by Quintus Catulus (73 B.C.) for the archives, of which the imposing foundations still remain. It lay in the depression between the Capitolium proper and the *arx*. On the *arx* was the temple of Juno Moneta, in which was the mint, down to the end of the first century B.C. The north summit is now occupied by the church of Santa Maria in Araceli; the south by dwellings, including the German embassy. Consult Platner, *Topography and Monuments of Ancient Rome*, pp. 291-308 (New York, 1911). See CAMPIDOGLIO.

In the United States the name is applied to the seat of the Federal Legislature (see WASHINGTON) and to the statehouses of the several States. Many of these are imposing and costly buildings, notably those at Albany, Hartford,

Providence, Austin, and the new one at Jefferson City. See illustrations accompanying ALBANY and HARTFORD.

CAPITOLINE GAMES. Annual games instituted 390 B.C., according to Livy (5, 40, 4), on motion of Camillus (q.v.), in commemoration of the preservation of the Roman capitol (citadel) from the Gauls. They were in charge of the guild of the Capitolini, whose members were chosen from those who lived on the Capitol. They seem to have been discontinued in later times. In 86 A.D. Domitian instituted Capitoline games on the Greek model, which were held every four years down to a late period of the Empire.

CAPITOLINE HILL. See CAPITOL.

CAPITOLINE MUSEUM, THE. A small but valuable collection of sculpture in a palace built by Michelangelo and situated on the left of the Piazza di Campidoglio, Rome. It was founded towards the end of the fifteenth century by Sixtus IV, by the donation to the public of the papal art collection, and was greatly enriched by Innocent X, Benedict XIV, Clement XIII, and Pius VI. It contains many interesting sarcophagi, also some famous antique statues, among which latter are "The Dying Gaul," "The Resting Satyr" of Praxiteles, "Leda with the Swan," and "Cupid and Psyche," and, finally, one of the most complete collections in existence of busts of the Roman emperors. An extension has been made to the palace, to contain sculpture found on the Esquiline since 1870.

CAPITOLINE WOLF. An ancient bronze, of the sixth century B.C., since 1473 in the Conservatori Museum in Rome, representing the suckling of Romulus and Remus by the she-wolf. The figures of the boys are modern, but the wolf stood with other works of art near the Lateran from the fall of the Empire. The figure of the wolf is perhaps the very one referred to by Cicero, in his third Catilinarian oration, as struck by lightning in 65 B.C. From the eleventh to the fifteenth century trials and executions were held at the place where the wolf stood.

CAPITOLINUS, JULIUS. A Roman writer of the time of Diocletian and Constantine the Great. To him are ascribed the biographies of the emperors Antoninus Pius, M. Aurelius, L. Verus, Pertinax, Albinus, Macrinus, the Maximini, the Gordiani, Balbinus, and Pupienus, included in the *Augustan History* (q.v.).

CAPITULARIES (Fr. *capitulaire*, ML. *capitulare*, from *capitulum*, chapter, from *caput*, head). A term used for the orders and constitutions published by the Frankish kings. The name was derived from the fact that these constitutions were divided into chapters (Lat. *capitula*). It is probable that the capitularies were usually the personal work of the ruler, assisted by his councilors; but in some cases the assembly of nobles was consulted, and for one class (see below) the assent of the people was necessary. Only nine capitularies of the Merovingian rulers are extant. Those of the Carolingians, especially those of Charles the Great, are very numerous. They may be divided roughly into three classes: (1) Constitutions for the whole Empire, regulating the military service, administration, finance, and justice, the relations with the Church, and the personal conduct of the subjects. (2) Special constitutions intended to complete or modify the law of some one of the

peoples in the Empire. These were called *Capitula per se scribenda*, and for them the assent of the people concerned was supposed to be necessary. (3) Capitularies for the *missi*, i.e., the special itinerant officials whose duty it was to act as the immediate representatives of the Emperor. Sometimes these were personal instructions; at other times, general orders to be promulgated to the people.

During the reign of Louis the Pious, Ansegisel, Abbot of Fontenelle, made a collection of the existing capitularies. A little later (before 858) Benedict the Levite published a second collection, which purported to contain the capitularies and some canons of councils. In reality it is made up of extracts from many sources, chiefly canon law, Roman law, and capitularies. There has been much controversy about this subject, and there seems to be some connection between his collection and the False Decretals. There were three other incomplete collections of little importance made soon after. Of modern editions four are worthy of note: Baluze, *Capitularia Regum Francorum* (Paris, 1677 and 1780); Walter, *Corpus Juris Germanici Antiqui* (3 vols., Berlin, 1824), in which the capitularies are contained in the second and third volumes; Pertz, *Monumenta Germaniæ Historica, Leges*, vols. i and ii (Hanover, 1835-37); and Boretius, id., *Legum Sectio II*, vols. i and ii (Hanover, 1883-97). The last is by far the best.

CAPITULATION (Fr. *capitulation*, from ML. *capitulare*, to capitulate, from *caput*, head), MILITARY. The surrender of an armed force, fortress, or besieged town to another armed force on previously fixed terms or stipulations. When it is considered no longer advisable to maintain the defense, notification is made to the besiegers, either by signal, white flag, or messenger, and negotiations are entered into to decide on the basis of the surrender.

In international law *capitulations* are agreements or formal compacts entered into, in time of war, for the surrender of a fortified place or fleet, or of a defeated army. The word is also used to designate the instrument containing the terms of such compact. The proposition to surrender may originate either with the commander of the successful or of the defeated party. Based on the terms proposed by either, the conditions of surrender are agreed upon, being modified, during consideration, by the relative strength and resources of the belligerents. Every supreme commander in the field is presumed to have authority to enter into such compacts, subject usually to certain restrictions imposed by the sovereign authority. If such restrictions exist, a commander should notify his opponent before the capitulations are signed. *Capitulations*, like *cartels* and *truces*, are drawn up like *treaties*, though with fewer formalities, and are interpreted in accordance with the same rules. Article XXXV of the convention concerning the laws and usages of war on land, adopted by the Second Peace Conference at The Hague (1907), requires that "Articles of capitulation entered into between the Contracting Parties are to take into account the rules of military honor. Once decided upon, these capitulations are to be scrupulously observed by both Parties."

CAPIZ, ká-péth'. The capital of the province of the same name, on the island of Panay, Philippines (Map: Philippine Islands, G 8). It is on the Río Panay 4 miles from its mouth and

has the most important harbor in the province. Highroads connect the town with Iloilo and Antique. The chief trade is in rice. Capiz was founded in 1716. Pop., 1903, 18,525.

CAPLIN, or **CAPELIN** (Fr. *caplan*, *capelan*, of unknown origin). A small fish (*Mallo-tus villosus*) of the smelt family (Argentinidae), abundant on both shores of Arctic America, occurring south as far as Cape Cod. It is a very delicious food fish, and is dried and exported to Great Britain to some extent. The eggs are deposited in incredible numbers in the sand along the Arctic shores, are washed by the waves upon the shore, where they hatch, and where the fry are washed back into the sea. Incredible numbers of the adults are also washed ashore in the surf and perish. It is of great importance to the people of Labrador and Newfoundland and of southern Alaska. Fossil caplin have been found in abundance in Greenland, inclosed in clay nodules of recent shales. See Plate of WHITEFISH, SMELTS, ETC.

CAPMANY Y DE MONTPALAU, káp-mā'né è de mōnt'pā-lou', ANTONIO DE (1742-1813). A Spanish polygraph, philologist, and antiquarian, born in Barcelona. He at first entered the army and served in the campaign against Portugal. Afterward he assisted Pablo de Olavide in his attempt to colonize the Sierra Morena, an enterprise which terminated disastrously, however, and Capmany went to Madrid, where he was made secretary of the Royal Academy of History in 1790. When the French took possession of the city in 1808, he fled to Seville and assisted in the Spanish war of independence. In 1812 and 1813 he was a member of the Cortes of Cadiz. His numerous publications, which are widely read in Spain, include the historical works *Memorias históricas sobre la marina, comercio y artes de la antigua ciudad de Barcelona* (4 vols., 1779-92); *Código de las costumbres marítimas de Barcelona* (2 vols., 1791), a translation from the Catalan original; and *Cuestiones críticas sobre varios puntos de historia económica, política, y militar* (1807), all of which contain valuable details on the commerce, industry, and maritime laws of the Middle Ages. He is probably even more celebrated for his literary and philological works, chief among which are the *Discursos analíticos sobre la formación y perfección de las lenguas, y sobre la castellana en particular* (1776); the *Filosofía de la elocuencia* (1776, and often reprinted, especially London, 1812, and Gerona, 1826); *Teatro histórico-crítico de la elocuencia castellana* (5 vols., 1786-94), republished in large part as *Tesoro de prosadores españoles* (5 vols., 1841); and his *Diccionario francés-español* (1805). His works are considered models of pure Castilian, which he always strove to preserve. It is on this account that the Real Academia Española included his name in the *Catálogo de Autoridades del Idioma*. Consult Sempere y Guarinos, *Ensayo de una biblioteca española* (6 vols., Madrid, 1785-89).

CAPNOMANCY (Fr. *capnomantie*, from Gk. καπνός, *kapnos*, smoke + μαντεία, *man-teia*, divination). A form of divination practiced, from Greek days onward, either by observing the smoke from incense burned for this purpose, or more commonly in connection with a sacrifice. (See SUPERSTITION.) If the smoke was thin and ascended in a right line, instead of being blown back by the breeze or spreading over the altar, the augury was good.

CAPOBIANCO, kă'pô-byân'kô. The founder and leader of the Carbonari (q.v.).

CAPO DI MONTE, kă'pô dë môn'tâ (It., head of the mountain). A place near Naples, where, in 1736, Charles III, King of Naples, caused an establishment to be set up for the production of soft porcelain. The King took so lively an interest in ceramic art that he even worked with his artists. The first porcelains made at Capo di Monte are said to be such a perfect imitation of the finest Japanese products that they might be mistaken for them. Charles's son, Ferdinand IV, who succeeded him when he left the throne of the Two Sicilies for that of Spain, taking many of the staff of the porcelain works with him, failed in successfully continuing the fabrication, and it finally sank during the political crisis of 1821.

CAPODISTRIA, kă'pô-dës'trê-â (Slav. *Kopar*). A fortified seaport town of the Austrian Crownland of Istria, situated on a rocky island in the Gulf of Triest, 8 miles southwest of the city of Triest. It is connected with the mainland by a stone causeway. It shows marked Italian influence. The old buildings (cathedral, town hall, and loggia) are Venetian and the population largely Italian. Though declining, its principal industries are fishing and ship-building, and it still has a considerable trade in sea salt, oil, and wine. Pop., 1890, 10,706; 1900, 10,711; 1910, 11,765. Capodistria was known to the Romans as *Ægida*, and later as Justinopolis. In the thirteenth century it came into the possession of Venice, and in 1797 of Austria.

CAPO D'ISTRIA, or **CAPODISTRIAS**, GIOVANNI ANTONIO, COUNT (1776-1831). A Russian statesman who was the President of the Greek Republic from 1827 to 1831. He was born in Corfu, Feb. 11, 1776, of a family which had come from the Illyrian town of Capodistria, near Triest, in the fourteenth century. He devoted himself to political life, and after holding a high position in the Republic of the Ionian Islands (q.v.), he entered the diplomatic service of Russia. He took an active interest in the movement for the liberation of Greece, but was always identified with the Russian party. After the Treaty of Tilsit in 1807, when the Ionian Republic was handed over to Napoleon, he went to St. Petersburg and was appointed attaché to the Foreign Office. His services in the diplomatic corps of the Russian government were of such a high order that he became the Assistant Minister of Foreign Affairs and shortly after counsel to the Czar. (See GREECE.) In 1827 he was elected President of Greece; and in January, 1828, he entered upon the duties of his office. He was an able diplomat and was sincerely concerned for the welfare of his native country, but his intimate association with Russia, whose ambitious designs so complicated the whole Eastern Question, made him unfit for the place to which he was called. Greece was torn by factions, and the most patriotic Hellenes were suspicious of Russia and therefore of Capo d'Istria. The President had been much imbued with the centralizing principles prevalent at the Russian court, and some of his measures, especially that restricting the liberty of the press, gave offense to advocates of civil liberty. In the latter part of his administration he suspended the Constitution of 1827 and ruled as dictator. He was assassinated at Nauplia, Oct. 9, 1831, by George and Constan-

tine Mavromichalis, whose family were leaders in the revolt against his dictatorship and the Russian influence. Consult Mendelssohn-Bartholdy, *Graf Johann Kapodistrias* (Berlin, 1864), and Phillips, *The War of Greek Independence* (London, 1897).

CAPONIERE, kă'pô-nêr', or **CAPONNIÈRE**, kă'pô'nyâr' (Fr. *caponnière*, Sp. *caponera*, cage for fattening fowls, from *capon*, *capon*). In fortification, a small stockaded inclosure or blockhouse so located as to fire along a dead angle. Such structures are usually found in the ditches of permanent fortifications. They are so disposed as to cover with their fire dead angles not otherwise provided for, and to afford a covered passageway between the ditch and the main parapets. *Caponieres* are also known as *tambours*, in recent works on field fortifications. See **TAMBOUR**; **FORTIFICATION**.

CAPOTE, kă'pôt' (Fr., dim. of *cape*, from ML. *cāpa*, *cape*). A long and shaggy outer garment with a hood, worn in southern Europe by soldiers, sailors, and travelers. In the Levant the capote is a mantle worn both by men and by women, and made either of rough cloth or of skins, retaining their hair. It is described by Curzon, in *Visits to the Monasteries of the Levant* (London, 1849), as "a sort of white frock coat, without sleeves, and embroidered in bright colors down the seams."

CAPOUL, kă'pôol', JOSEPH AMÉDÉE VICTOR (1839-1924). A French tenor, born in Toulouse. He graduated at the Conservatoire in Paris and sang with brilliant success at the Opéra Comique. Subsequently he sang in London with Christine Nilsson, in New York with Patti, in Vienna and St. Petersburg. In 1892 he accepted the position of professor of operatic singing at the National Conservatory in New York. In 1898 he took up his residence in Paris, being in great demand as a singing teacher. In 1900 he became stage director of the Grand Opéra.

CAPPADOCIA, kă'pâ-dô'shî-â (Gk. *Καππαδοκία*, *Kappadokia*, OFers. *Katpatuka*). In ancient geography, an extensive region in the eastern part of Asia Minor. It was for a time a Persian province; Alexander the Great received tribute from its ruler Ariarathes. After Alexander's death his successors sought to exercise dominion over Cappadocia, but the son of Ariarathes resigned the throne and founded a line of kings of Cappadocia. Later, supported by the Romans against Mithridates, the Cappadocians elected a native, Ariobarzanes, as King. During the civil wars between Cæsar and Pompey, Octavianus and Antony, Cappadocia changed sides frequently. Finally, in 17 A.D., it became a Roman province. It was bounded by Lycaonia and southern Galatia on the west, by Cilicia and Commagene on the south, by Armenia on the east, and by Galatia and Pontus on the north. While under the Persian Empire, however, Cappadocia included what was afterward Pontus, which was called Lesser Cappadocia. The northern part of Cappadocia (in the narrower sense) was traversed by the river Halys (Kizil Irmak), near whose banks the Argæus Mons (Arjish) towers to a height of over 13,000 feet. Among the towns were Mazaca (Cæsarea), Comana, Tyana, and Melitene. The population of ancient Cappadocia and Lycia, represented now by the primitive mountain tribes called Taktadji, is of considerable anthropological interest, since some authorities have connected

them with the Hittites. They seem to have been Aryans closely related to the Armenians, although Brinton (1895) thought there was an element belonging to the peoples of the Caucasus revealed in their ancient inscriptions and local dialects. Sergi (1901) disputes the Hittite relationship on craniological grounds. The chief literature of the subject is to be found in Von Luschan and Petersen's *Reisen in Lykien* (Vienna, 1889); Von Luschan's article on the "Tachtadsehy," in the *Archiv für Anthropologie* for 1901; and Chantre's *Recherches anthropologiques dans l'Asie occidentale* (Lyons, 1895). There is an interesting article by J. W. Crowfoot on "Survivals among the Kappadokian Kizilbash," in the *Journal of the Anthropological Institute* (London, 1900). Consult also Grothe, "Meine Schürfungen in Kappadokien," in his *Meine Vorderasiens-Expeditionen* (Leipzig, 1911).

CAPPEL, ká'pél', LOTIS (1585-1658). A French Hebraist, born at St. Elier. He studied theology at Oxford and Saumur, was appointed professor of Hebrew at Saumur in 1613, and professor of the theology there in 1633. In his *Arcanum Punctuationis Revelatum* (1624) he showed that vowel points had been introduced into Hebrew writing at a period comparatively late. As this theory and his doubt of the integrity of the Old Testament text seemed to attack the authority of the Scriptures, he was violently attacked, in particular by Buxtorf. He was one of the founders of biblical criticism, because of his *Critica Sacra* (written 1634; well known before its publication in 1650). He wrote a catechism (1619) that was used for a time in Huguenot churches. Consult Schneidemann, *Die Contröversen des Ludovicus Capellus mit den Buxtorfen* (Leipzig, 1879).

CAPPON, JAMES (1855-). A Canadian educator. He was born in Dundee, Scotland, and graduated from Glasgow University in 1881. After two years spent in the study of modern languages in Italy he returned to Scotland and became a tutor in St. Margaret's College, Glasgow, and later, extramural lecturer in connection with Glasgow University. In 1888 he went to Canada and was appointed professor of the English language and literature and dean of the faculty of arts in Queen's University, Kingston. He afterward became one of the editors of the *Queen's Quarterly Magazine*. He gained a high reputation as essayist and literary critic. His principal publications are: *Victor Hugo: A Study and a Memoir*; *Britain's Title in South Africa* (1901); *Studies in Canadian Poetry*; *What Classical Education Means*; *The Sectarian Principle in the Canadian Constitution*; *Roberts and the Influences of his Time* (1906).

CAPPONI, káp-pō'nè, GINO, MARCHESE (1792-1876). An Italian historian and statesman. He was born in Florence of an illustrious family. He traveled in England and made many acquaintances there. On his return to Italy he founded at Florence, with the help of Vieusseux, the *Antologia Italiana*, an Italian *Edinburgh Review*, which was suppressed in 1832, when he established the *Archivo Istórico Italiano*. Devoted to science and philanthropic endeavor, he early gained the confidence of the citizens, and in 1848, although blind, he was called to the head of the administration in Tuscany. Attacked by the Radicals, he retired to private life in a short time. After the War of 1859 he was made a senator. As a member of the Accademia

della Crusca he assisted in preparing new editions of the academical dictionary, and after he had become blind prepared, with Beechi, Borghi, and Niccolini, an improved edition of Dante's *Divina Commedia* (Florence, 1837). Among his other publications, the most important is *Storia della repubblica di Firenze* (2 vols., 1875), still a standard work. For his life, consult Tabarrini, *Gino Capponi* (Florence, 1879), and Von Reumont, *Gino Capponi, ein Zeit- und Lebensbild* (Gotha, 1880).

CAPPS, EDWARD (1866-). An American classical philologist, born Dec. 21, 1866. He received the degrees of A.B. at Illinois College (1887), and Ph.D., Yale University (1891). He was tutor in Latin at Yale from 1890 to 1892, assistant professor of Greek at the University of Chicago from 1892 to 1896, associate professor from 1896 to 1900, and professor in 1900. In 1907 he became professor of classics at Princeton University. He is the author of *From Homer to Theocritus* (New York, 1901), of an edition of *Four Plays of Menander* (Boston, 1910), which presents with introductions and commentary the four plays of Menander (q.v.) found after 1905, and of numerous papers. In 1913-14 he was president of the American Philological Association.

CAPPS, WASHINGTON LEE (1864-). An American naval officer, born at Portsmouth, Va. He graduated from the United States Naval Academy in 1884 and was promoted through the grades to be naval constructor in 1895. Nearly all of his service was connected with the designing and construction of ships. From 1896 to 1898 he was superintendent of construction for the navy at the Union Iron Works, and from 1899 to 1901 a member of the board of inspection and survey at Washington. He was appointed chief constructor of the navy and chief of the bureau of construction and repair, with the rank of rear admiral, in 1903. Four years later he was reappointed, but resigned in 1910 and was given a permanent commission as chief constructor with the rank of rear admiral. He served on special duty and as president of various boards for the construction of United States naval vessels building on the Atlantic coast.

CAPRARA, ká-prá'rá, ÆNEAS SYLVIVS, COUNT (1631-1701). An Austrian general, born in Bologna. He entered the army of the Empire, fought under his kinsman Montecuculi against the French and the Turks, and in 1674 received an independent cavalry command. He was vanquished by Turenne at Sinsheim, but distinguished himself at Ensisheim, and continued in the Rhine campaigns until 1678. In 1683 and succeeding years he was active in the defense of Hungary against Turkish invasion. Appointed vice president of the council of war at Vienna, he hindered Prince Eugene, of whom he was jealous.

CAPRARA, GIOVANNI BATTISTA, CARDINAL (1733-1810). An Italian ecclesiastic, of the family of the counts of Montecuculi. He was born in Bologna, and early entered the career of ecclesiastical diplomacy, acting as nuncio at Cologne, Lucerne, and Vienna. He was named Cardinal by Pius VII, in 1792, in recognition of his service in Austria, one of peculiar difficulty under Joseph II. In 1793 he was made Bishop of Jesi, and in 1801, on Napoleon's express request, *legate a latere* in Paris. Here he conducted the very arduous negotiations

which ended in the Concordat. Napoleon nominated him Archbishop of Milan (1802), and was himself crowned by him there with the Iron Crown of Lombardy in 1805. He remained in Paris as legate until the imprisonment of the Pope. His fortune he left to the hospital in Milan.

CAPRÆ. See CAPRI.

CAPRERA, kâ-prâ'ra (It., goat island). A rocky island off the north coast of Sardinia, 5 miles long and about 2 miles broad, connected with the island of La Maddalena by a causeway and drawbridge (Map: Italy, D 6). It is famous as having been the place of residence of Garibaldi, who died there June 2, 1882.

CAPRI, kâ-prê (Lat. *Capræ*, from *caper*, goat). A beautiful rocky island in south Italy, at the southern entrance to the Bay of Naples, 3½ miles west of Cape Campanella—from which it is separated by the Bocca Piccola—and 20 miles southwest of the city of Naples (Map: Italy, D 12). It is 4½ miles long, 3 miles wide, 10½ miles in circumference, 5¾ square miles in area. The highest point is Mount Solaro, on the west coast, 1920 feet above the sea. Capri has always been celebrated for its delightful climate and pure air, and although the supply of drinking water is unsatisfactory, it is visited yearly by over 30,000 strangers. It is a favorite summer resort for residents of Naples. Capri, the capital of the island and an episcopal residence, is situated between two cliffs 460 feet high. Population of commune, 1901, 4114; 1910, 4462. From the Marina Grande, north of the town, where is found the only good landing place on the island, there is daily communication by steamboat with Naples and Sorrento. Anacapri, which is 880 feet above the sea, on a plateau in the western and more fertile part of the island, is reached by a winding road cut through the rock and completed in 1876. Population, 1901, 2110; 1910, 2376. The town is commanded by the ruins of the castle of Barbarossa, named after the pirate who destroyed it in 1544. On the shore north of Anacapri, and 1¼ miles west of the Marina Grande, is the famous Blue Grotto (Grotta Azzurra), which is entered from the sea by a narrow opening not more than 3 feet high. The grotto is 175 feet long, 100 feet broad, and 41 feet high, with water 48 feet deep. The ancient church of San Costanzo, the patron saint of the island, marks the site of the ancient town. In the northeast corner of the island are the precipitous rocks, 745 feet high, from which, tradition says, Tiberius hurled his victims into the sea, and the ruins of the twelve villas built by Tiberius in honor of the twelve gods. The English captured the island in 1806, during the Napoleonic wars, and built fortifications, some of which remain. In 1808 they lost it to the French under Lamarque; but recovering it in 1813, restored it to King Ferdinand IV of Sicily. Local products comprise fine white and red wine, oil, oranges, lemons, and figs, fish, and quail. The United States is represented by a consular agent. Consult: Gregorovius, *Die Insel Capri* (Leipzig, 1897); Allers, *Capri*, illustrated (Munich, 1894); Furehheim, *Bibliographia dell' isola di Capri* (Naples, 1899); Weichardt, *Das Schloss des Tiberius und andere Römerbauten auf Capri* (Leipzig, 1900).

CAPRICCIO, kâ-prê't'chô (It., caprice, probably from It. *caprio*, Lat. *caper*, goat). In art the term signifies a painting or engraving composed without regard to the ordinary rules of

pictorial art, whimsical and fanciful in idea and arrangement.

CAPRICCIO. In music, a species of free composition whose form is not subject to rigid rule. The fancy of the composer is allowed free play, his aim being to produce piquant and striking effects, in both melody and harmony. A shorter piece of this character is often termed *capricciotto*.

CAPRICORNUS (Lat., goat-horned, from *caper*, goat + *cornu*, horn). The Goat, a southern constellation, and the tenth sign of the zodiac, denoted by the sign ♈, representing the crooked horns of a goat. It is usually represented on the globe as having the fore part of a goat, but the hinder part of a fish. It is one of the least striking of the zodiacal constellations. It was, however, celebrated among the ancients, who regarded it as the harbinger of good fortune and as marking the southern tropic (q.v.) or winter solstice (q.v.), wherefore they called it the "Southern Gate of the Sun." It contains no large stars, the two largest, which are situated in the horns, being only of the third magnitude.

CAPRIFICATION (Lat. *caprificatio*, from *caprificare*, to ripen figs by the pollination of the gall insect, from *caper*, goat + *ficus*, fig). A method which has long been employed in the Orient for securing and hastening the maturation of figs, and which consists in suspending fruit-bearing branches of the wild fig or caprifig above or beside those of the cultivated tree. A small hymenopterous gnatlike insect (*Blastophaga grossorum*) crawls from the caprifig into the Smyrna fig of commerce and, being covered with the pollen of the wild fig, fertilizes therewith the cultivated fig. If pollen is not introduced, the figs may fail to develop, and finally fall to the ground. When pollenized, the seeds develop and the fruits grow to their proper size and mature. The fig insects were introduced into California in 1899, with the result that about 200 tons of Smyrna figs of excellent flavor were harvested in 1910. See FIG.

CAPRIFOLIA/CEÆ (Neo-Lat., ML. *Caprifolium*, from Lat. *caper*, goat + *folium*, leaf). A family of dicotyledonous plants, consisting of shrubs and herbs which have opposite leaves without stipules, and flowers disposed in corymbs, in heads, or in whorls. The calyx is four to five cleft; the corolla, tubular or wheel-shaped, sometimes irregular. The stamens are inserted on the corolla at its base and alternate with its lobes. The ovary is free, one to five celled. The fruit is generally a berry, sometimes dry, but not splitting open when ripe. The family is very nearly related to Rubiaceæ, differing chiefly in the want of stipules. More than 300 species are known, chiefly natives of the temperate and colder parts of the Northern Hemisphere. To this order belong the honeysuckle, elder, viburnum, and snowberry (qq.v.), the chief genera being *Lonicera*, *Sambucus*, *Viburnum*, *Symphoricarpos*, *Linnaea*, *Diervilla*, etc.

CAPRIMUL/GIDÆ (Neo-Lat., from Lat. *caper*, goat + *mulgere*, to milk). A family of birds, including the whippoorwills, nightjars, etc. The family is usually called "goatsuckers," but the name "nightjar" is better. See NIGHTJAR.

CAPRIVI, kâ-prê'vé, GEORG LEO, COUNT VON (1831-99). The second Chancellor of the German Empire. He was born Feb. 24, 1831, at Charlottenburg, studied in Berlin, and in 1849 volun-

teered in the Kaiser Franz Grenadiers. During the campaign in Bohemia in 1866 he was made a major and a member of the general staff of the First Army Corps. He distinguished himself during the Franco-Prussian War, and as chief of staff of the Tenth Army Corps served with distinction at Metz and Orléans and in the Loire campaigns. His advance in rank and in responsible commands was rapid. In 1882 he was appointed commander of the Thirtieth Infantry Division at Metz; in March, 1883, he was selected by Bismarck to succeed Admiral Stosch as Chief of the Admiralty, greatly to the dissatisfaction of the officers of the navy. He justified the judgment of the great Chancellor, however, by his mastery of the details of the department and his successful reorganization of the navy upon its present basis. In 1888 he resigned, and was made commander of the Tenth Army Corps, stationed in Hanover. He received the order of the Black Eagle, and in March, 1890, succeeded Bismarck as Chancellor of the Empire and President of the Prussian Ministry. He was made a count in 1891. Succeeding the most powerful statesman in Europe at the beginning of the reign of restless William II, Count Caprivi's position as Chancellor was one of many trials and great difficulty. Nevertheless, he showed himself an able and faithful administrator. He carried the bill for an increase in the army through the Imperial Reichstag; initiated a policy of reciprocity, through treaties with Austria-Hungary, Italy, Belgium, and Russia, in spite of the narrow opposition of the Prussian landowners; and maintained a moderate policy with reference to the growing Socialist party. In July, 1890, he arranged with Lord Salisbury, representing England, the so-called Anglo-German partition of East Africa. (See GERMANY.) He resigned the presidency of the Council in 1892, and the chancellorship in 1894. Caprivi was, like Bismarck, a man of great physical strength and possessed considerable mental power, with a great capacity for work. He died on his estate, Skyren, in Brandenburg, Feb. 6, 1899. Consult *Die Reden des Grafen von Caprivi . . . 1883-1893* (Berlin, 1894).

CAPROIC, CAPRYLIC, and CAPRIC ACIDS. Acids represented respectively by the formulæ $C_6H_{12}O_2$, $C_8H_{16}O_2$, and $C_{10}H_{20}O_2$, and members of the acetic or fatty acid series. They are found in butter and in other fats. They derive their names from *capra*, a goat, in consequence of their more or less resembling in smell the odor of that animal. They may be obtained, along with butyric acid, another member of the fatty-acid series, by boiling (saponifying) butter with caustic potash.

CAP'RON, ALLYN (1846-98). An American soldier, born in Tampa, Fla., son of an officer in the Mexican War. He graduated at West Point in 1867, and rose to be captain of artillery in 1888. During the Sioux campaign of 1890 he served with distinction, and in 1898 during the Spanish-American War participated in the invasion of Cuba. On July 1 he opened the battle of El Caney by firing, as commander of Battery E, First Artillery, upon the stone fortifications which lined the ridge. He died of typhoid fever contracted during the campaign.

CAPS and HATS (Swed. *Mössorna och Hatturne*). Names of political parties in Sweden in the early part of the eighteenth century. The Caps were in favor of stripping the monarch of all semblance of authority; the Hats wished

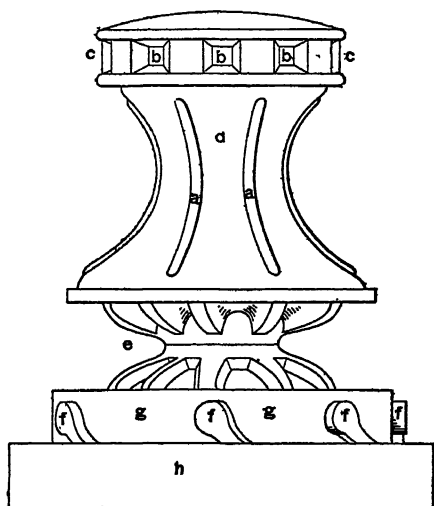
the King to retain some measure of power. In foreign affairs the Caps were friendly to Russia, while the Hats favored a French alliance. The Hats were the aristocrats, the Caps constituted the popular party.

CAPSELLA (Lat. *capsa*, box, hence *capsella* [dim.], from the shape of the fruit or pod). A genus of plants belonging to the family Cruciferae. *Capsella bursa-pastoris*, the common shepherd's-purse, is one of the most common weeds, having been naturalized everywhere from Europe. The common name is suggested by the flattened triangular pod. It is extremely variable in foliage, and these variations have been made the basis of 50 to 100 elementary species by various authors. Its rosette of leaves and raceme of small white flowers or pods may be observed in waste grounds everywhere from early spring until fall.

CAP'SICUM (Neo-Lat., from Lat. *capsa*, box, from *capere*, to hold). A genus of plants of the family Solanaceae, having a wheel-shaped corolla, projecting and converging stamens, and a dry berry. The species are all of a shrubby, bushy appearance, and have more or less woody stems, although they are annual or biennial plants. About 90 species have been named. They are natives of tropical America, have simple leaves and rather inconspicuous flowers, and some of them are in very general cultivation in tropical and subtropical countries for their fruit, which is extremely pungent and stimulant and is employed in sauces, mixed pickles, medicine, etc., often under its Mexican name of *chilies*. The fruits of different species differ in form, being round, oval, conical, heart-shaped, etc.; they vary from half an inch to 4 inches in length, and are sometimes of a bright red, sometimes of a yellow color. In all, the dry berry has an inflated appearance, and contains numerous whitish, flattened seeds, which are even more pungent than the leathery epidermis or the spongy pulp. Cayenne pepper consists of the ground seeds and pods. *Capsicum annuum*, sometimes called common capsicum or chili pepper, is perhaps the most common species in cultivation. *Capsicum frutescens*, sometimes called goat pepper, and *Capsicum baccatum*, sometimes called bird pepper, are perennial in tropical latitudes. They have great pungency, and the former is generally described as the true Cayenne pepper. *Capsicum cerasiforme*, which has a small, cherry-like fruit, is frequently grown as an ornamental. *Capsicum grossum*, with a large, oblong, or ovate fruit, known as bell pepper, is cultivated in many forms. The fruit is used either ripe or unripe, except for making Cayenne pepper, for which dried ripe fruit is employed. See PEPPER, and Plate of VEGETABLES, GARDEN.

CAP'STAN (Fr. *cabestan*, Sp. *cabestrante*, probably from Lat. *capistrare*, to tie with a halter, from *capistrum*, halter, from *capere*, to hold). A machine used on shipboard for handling the anchor and other heavy weights. It was formerly made of wood, with iron fittings, but is now generally of iron. It consists of the *barrel*, *drumhead*, *wildcat*, *pawl head*, and *spindle*. The axis of the capstan is vertical, and is formed of an iron or steel spindle. The barrel is not cylindrical, but is smaller at the centre, towards which the upper and lower ends curve. This curve causes a rope which is wound round the barrel to slip towards the centre as it is pulled in by the capstan in turning. To increase the friction around the

barrel, ridges, called *whelps*, extend up and down its surface. Around the circumference of the drumhead are square holes extending in towards the centre to a depth of several inches, forming sockets for inserting the capstan bars, which stand out when in place like the spokes of a wheel. The bars have scores or grooves in the outer ends, through which is passed a small rope called the *swifter*, that serves to keep the bars in place. A capstan bar of ordinary size is sufficiently long to permit three or four men to push against it in *heaving*. The wildcat is a deep groove between the lip on the lower end of the barrel and the pawl head, and is designed to grip the chain which rests in it for about half the circumference. To prevent the chain from slipping, there are, on the upper and lower sides of the groove, ridges or whelps extending radially, and growing thicker and higher as they



CAPSTAN.

a, whelps on the barrel; b, sockets or pigeonholes for capstan bars; c, drumhead; d, barrel; e, wildcat; f, pawls; g, pawl head; h, base containing pawl rack.

approach the axis. These whelps catch between the links of the chain that stand vertically, and so prevent the latter from slipping. On the circumference of the pawl head are pivoted the *pawls*, which are short bars of iron working in a *pawl rack* in the *capstan bed*, which is bolted to the deck. To *walk back* the capstan, or reverse the motion, it is necessary to lift these pawls and throw them over, so that they will act only in the opposite direction. Wooden capstans, of very similar form to those now used, but without the wildcat, were devised by Sir Thomas Moreland in 1661. In the days of rope anchor cables they were hauled in by means of a messenger, as the cable itself was too large to be worked around the capstan barrel. The messenger was a smaller rope, which was gripped to the cable by rope *nippers*. It led to the barrel of the capstan and back again to near the hawse pipe. The nippers were taken off one by one as they approached the capstan, and others put on farther forward. After the introduction of chain cables, messengers continued to be used until the invention of the wildcat enabled the chain to be brought directly to the capstan. In steamers, capstans are now generally worked by steam power; instead of capstans many ships

have steam *windlasses*, which resemble two capstans placed base to base, with the axes horizontal. In recent battleships and in some large merchant steamers the barrel and drumhead are omitted, leaving only the wildcat and a covering plate above it. See *ANCHOR*.

CAPSULE (Fr., from Lat. *capsula*, little box, *capsa*, box, from *capere*, to hold). A dry, dehiscent fruit, made up of more than one carpel. Sometimes it contains but a single chamber; in other cases there are as many chambers as there are carpels. The methods of dehiscence are numerous, but quite uniform within a plant group. Capsules are often called "pods," a more inclusive term. The term is also sometimes applied in a general way to spore cases. See *FRUIT*.

CAPSULE. A term in medicine for a thin membranous covering, casing, or envelope, like a pouch or bag, containing some part or organ. The capsule of the kidney is a smooth, fibrous membrane closely investing the kidney and forming its outer coat. The capsule of the lens of the eye is a transparent, elastic, brittle, and structureless membrane. In bacteriology the term is applied to the thin envelope which surrounds certain microorganisms, e.g., the *streptococcus capsulatus*. The word is also extensively used for a small gelatinous case or envelope in which medicines are inclosed before administration, to prevent the patient's tasting an unpleasant drug, or for convenience of carrying, as well as to secure a more soluble coating than that of many pills.

CAPTAIN (OF. *capitain*, ML. *capitaneus*, from Lat. *caput*, head, chief). A title found in almost every language to denote a chief of a small number of men. In the United States army a captain ranks next above a first lieutenant and below a major, and commands a company, troop, or battery. A captain present for duty with his command is responsible for its discipline and efficiency. He is accountable for the public property that constitutes its equipment; for the proper performance of duties connected with the subsistence, pay, and clothing of its members; and for the correct keeping and rendition of all company accounts, reports, and returns. The captain recommends the noncommissioned officers of the company, who are appointed by the colonel, and from the sergeants he selects the first sergeant. In camp or barracks the captain maintains a careful supervision over the cooking and messing of his men, and is responsible for the camp and garrison equipage and the arms and the clothing of his company. See *ARMY ORGANIZATION*; *RANK AND COMMAND*.

A captain in the navy is the commanding officer of a man-of-war, and in most navies this title is given to officers next in rank to rear admirals. Its origin as a naval title is disputed, but it seems to have come into use about the time that war vessels took on their present character by combining the navigating with the fighting force; previous to this the master (which is still the designation of the commander of a merchant ship) had charge of the navigation, in which he had sailors to assist him; while the fighting was done by soldiers put on board for the purpose and commanded by a military officer. In the British navy the rank was first clearly defined in 1747, and those captains who commanded postship (i.e., rated ships), if of three years' standing, took rank with colonels of the army, and they appeared as post captains

in the royal navy list until 1824. Before and since this latter date, in the British navy and in that of the United States, the name post captain was used to distinguish commanding officers of frigates and larger ships from commanders and master commanders who were called captain, by courtesy. Until 1862 the rank of captain was the highest in the United States navy (see ADMIRAL), but captains who had commanded squadrons were addressed by the courtesy title of commodore. According to the order of the President of June 7, 1901, captains may be ordered to command a division of ships, a vessel of the first rate, or second rate, or one not rated. The number of captains on the active list of the United States navy is, by law, 70, but this number is exclusive of those, 25 in number, who have been promoted one or more numbers for service during the war with Spain. They rank with colonels of the army and receive the same pay (\$4000, with an addition of 10 per cent for each five years of service until the maximum of \$5000 is reached). On duty beyond the continental limits of the United States all officers receive a 10 per cent increase of pay.

CAPTAIN, THE. A play by Fletcher, assisted by either Jonson or Middleton, or both, published in folio in 1647. Its earliest recorded production is May 20, 1613, when Hemings's company appeared in it at court. It contains the dainty lyric "Come hither, ye that love."

CAPUA, kăp'û-â, *It. pron.* kă'pû-â. An archiepiscopal city of south Italy, in the Province of Caserta, in a fertile but unhealthy situation on the left bank of the Volturno, 18 miles north of Naples (Map: Italy, J 6). As the only fortress guarding Naples on the north, it was of great importance to the former Kingdom of Naples. The cathedral, dating from the eleventh century, but almost entirely modernized, has in the entrance court granite columns from ancient Casilinum, on whose site Capua was built, in the ninth century; in the church of the Annunziata are ancient bas-reliefs; and beneath the arch of the Piazza de' Giudici—the market place—are many ancient inscriptions. The Museo Campano contains reliefs and inscriptions from the amphitheatre of ancient Capua, ancient and mediæval sarcophagi, and various statues, heads, coins, etc. On the bridge over the Volturno is a statue of St. Nepomuc: the Torre Mignana inside, and the Cappella de' Morti outside the town, commemorate the bloody attack on Capua in 1501 by Cæsar Borgia. Not far from the city is the field where the soldiers of Garibaldi and of Piedmont defeated King Francis II of Naples, Oct. 1, 1860. For ancient Capua, see **SANTA MARIA CAPUA VETERE**. Pop., 1881, 14,000; 1901, 14,285; 1911, 13,319.

CAPUANA, kă-pwâ'nâ, LEIGI (1839-). An Italian journalist, novelist, and critic. In 1902 he became professor at Catania. With Verga he stands at the head of the Sicilian group of *veristi* or 'realists' who, with their vivid portrayals of Italian regional life with almost photographic exactness, represent one of the most virile branches of Italian fiction. In later years Capuana turned to the historical novel.

CAPUCHIN, kăp'û-chîn or kăp'û-shên', **THE**. A comedy by Samuel Foote, produced at the Haymarket, Aug. 17, 1776, and published in octavo, 1778. It is a modification of the same author's *Trip to Calais*, and is aimed at a creature of the Duchess of Kingston. (See article on **KINGSTON**, **ELIZABETH**, **DUCHESS OF**.)

Foote played the part of O'Donovan in it. Its performance was stopped by the public censor, but the attack was continued in *The Bankrupt*.

CAPUCHIN (kăp'û-shên') **MONKEY** (*It. cappuccino*, Franciscan friar, because of the cowl-like black spot on the head). Any sapajou of the genus *Cebus*, but more specifically the "weeper" (*Cebus apella* or less correctly *capucinus*), one of the common species in northern South America, and often kept in captivity. See **SAPAJOU**, and Plate of **AMERICAN MONKEYS**, under **MONKEY**.

CAPUCHINS (*Fr. capucin*, *Sp. capuchino*, from *It. cappuccio*, cowl, *ML. caputium*, *capitium*, from *caput*, head). A branch of the Franciscan Order of friars, whose rule is essentially the same as that of the Friar Minor, or Minorites. They were founded at Montefalco, in Umbria, by Matteo di Bassi, an Observantine Franciscan, who in 1525 left his monastery in order to live the stricter life of a hermit. This he was permitted to do by Pope Clement VII in 1526. Being imprisoned at Ancona for his alleged disobedience to monastic order, he was released through the influence of the Duchess of Camerino, niece of the Pope, and he and his companions, in 1528, were allowed to wear beards and peculiar, long-pointed hoods (hence the name), to impart their habit to any one who might be willing to join them, to live as hermits in wild and desolate places, to go barefoot, and to call themselves the "Hermit Friars Minor." They grew rapidly, and had great success in making converts. After the Jesuits, no order has attracted to itself so many men of the highest birth as this, in which poverty is pushed to its utmost extreme. They have always paid much attention to learning, and have produced a number of considerable theologians. Five have been canonized and six beatified. The order reached its greatest development in the eighteenth century; in 1775 it had 64 provinces with 31,000 members, a number which has never since been reached. They are most numerous in Austria, but have 22 apostolic mission districts in all parts of the world. In the United States they have two provinces, one with its chief house in Detroit, Mich., and the other centred in Pittsburgh, Pa., and a missionary district in California. To Protestants, the best-known Capuchins are Bernardino Ochino, who was converted to Protestantism in 1542, and Father Theobald Mathew, the famous Irish apostle of total abstinence. There are also Capuchin nuns, founded in Naples, 1538, who are properly a branch of the Clares (q.v.), insisting strongly on poverty, and following as far as possible the Capuchin constitution.

CAPULETTI ED I MONTECCHI, kă'pû-lăt'ê âd ê môn-têk'kê (*It.* Capulets and Montagues). See **BELLINI**.

CAPULETS AND MONTAGUES. The English forms of the names of the Cappelletti and Montecchi, two noble families of Verona, chiefly memorable from their connection with the legend on which Shakespeare founded *Romeo and Juliet*. They are mentioned by Dante (*Purgatorio*, vi, 106) in connection with Albert of Hapsburg, King of the Romans, who was murdered in 1308. This event has supplied the Veronese with a date for their legend. Implicitly believing the story, they point out the house of Juliet's parents and her tomb. The legend is undoubtedly Eastern in origin, having analogues in the stories of Pyramus and Thisbe, Hero and Leander,

and Abrocomas and Anthia (as related in the *Ephesiaca* of Xenophon of Ephesus, a writer of the second century A.D.). The incident of the sleeping potion was, moreover, quite common in late Greek romance. So far as is known, the essentials of the story reached Italy late in the fifteenth century, appearing in a short novel by Massuccio of Salerno, first published in 1476. The novel *La Giulietta*, by Luigi da Porto, printed in 1535, after the death of the author, follows more closely the outline of Shakespeare's play. He states, in an epistle prefixed to the work, that the story was told him "by one Peregrino, a man 50 years of age, much experienced in the art of war, a pleasant companion, and, like almost all the Veronese, a great talker." Da Porto, then, was the first to claim that the story was based on fact. This was a common make-believe of the sixteenth-century story-tellers. In 1554 Bandello published in his collection of tales another Italian version of the legend. It was entitled *The Unfortunate Death of Two Unhappy Lovers—One by Poison and the Other of Grief*. Both writers fix the date of the event by saying that it took place when Bartolommeo della Scala ruled Verona (1301-04). A French version of the tale was published by Pierre Borsteanu in his *Histoires tragiques* (1559). It was translated into English in 1567 and published in Painter's *Palace of Pleasure*. Five years before, Arthur Brooke published an English poem on the same subject, entitled *The Tragical History of Romeus and Juliet, written first in Italian by Bandell, and now in English*. Shakespeare seems to have founded his tragedy on Brooke's poem, with some use of Painter's version. Yet there is some evidence that the story had been dramatized before the appearance of Shakespeare's play. In that case Shakespeare probably made use of his predecessor. It was Brooke who first called the Montecchi "Montagues," and the Prince of Verona "Escalus," instead of Scala. Wright and Cary, in translating Dante, have followed the example of Shakespeare, and rendered the Italian names of the *Divina Commedia* into the familiar "Capulets and Montagues" of *Romeo and Juliet*. The historical date of the tragedy has not, however, been adopted by modern stage managers, who very properly bring down the action from the beginning to the close of the fourteenth century, when commercial opulence and the revival of arts and letters supply accessories more in keeping with the drama than the ruder age to which history must assign the "civil broils," and the fall of the Capulets and the Montagues. Consult: Daniel, "Originals and Analogues of Romeo and Juliet," in *New Shakespeare Society Publications* (London, 1875); or the New Variorum Edition of *Romeo and Juliet*, by H. H. Furness (Philadelphia, 1871; last rev., 1903).

CAPUS, ká'pú', ALFRED VINCENT (1858-1922). A French journalist and dramatist. He was born at Aix and received a technical education, being intended for the engineering profession. This he did not follow, however, devoting himself, instead, to literary work. After some experience in journalism gained on the *Figaro*, he made his name as a satirist who employed his mordant wit with telling effect in contemporary criticism. This reputation he gained soon after 1882. In 1890 came his first novel, *Qui perd gagne*, which showed his ability in the realm of imaginative literature. His other novels include *Faua départ* (1891), *Mon-*

sieur veut rire (1893), and *Années d'aventures* (1895). It was as a dramatist, however, that Capus found fullest scope for his creative fancy. His plays include: *Brignol et sa fille* (1895); *L'Innocent* (1896, in collaboration with Alphonse Allais); *Rosine* (1897); *Mariage bourgeois* (1898); *Les maris de Léontine* (1900); *La veine* (1901); *La petite fonctionnaire* (1901); *Les deux écoles* (1902); *La châtelaine* (1902); *L'Adversaire* (1903, in collaboration with Emmanuel Arène); *Notre jeunesse* (1904); *Monsieur Piégois* (1905), and *L'Attentat* (1906, in collaboration with Descaves); *Hélène Ardouin* (1913). In 1914 he was elected a member of the French Academy.

CAPUT MORTUUM (Lat., dead head). In historical research, a term which denotes the residuum of a traditional narrative after all the supernatural or extraordinary incidents have been cast aside. What remains may be possible or likely, but rests on no evidence. In chemistry the term was formerly used of the residuum of chemicals after the volatile substances had escaped. It is still used metaphorically for a thing or institution which has been really destroyed by the elimination or abolition of its essential features or elements, the form alone remaining.

CAPYBARA, ká'pé-bá'râ (Sp., Portug., from the native name), or **CARPINCHO**. A large South American aquatic rodent (*Hydrochaeris capybara*) of the family Caviidae. It is about 4 feet long and weighs nearly 100 pounds, thus making it the largest known rodent. It resembles a gigantic rough-coated guinea pig, having a heavy flat head, with small eyes and ears, and a blunt muzzle. The short, stout legs have hooflike claws on the feet; the tail is very short, and the brown hair is scant and bristly. The capybara feeds exclusively on vegetable food. It is easily tamed, and regarded as stupid. The flesh, except that of old males, is good. The capybara is known throughout Spanish South America as "carpincho," but is called in British Guiana "water hog" and "water horse," a corruption of the Dutch *waterhaas*, i.e., water hare. Consult *Proceedings of Zoological Society of London* (1894). See PLATE of CAVIES, ETC.

CARABALLOS (ká'râ-bá'lyōs) **MOUNTAINS**. The chief mountain system of Luzon, Philippine Islands. It consists of three ranges: the Caraballos Occidentales, which divides into the Cordillera Norte and Cordillera Central; the Sierra Madre, or Cordillera Oriental; and the Caraballos Sur. They are of volcanic origin. Mayón, or Albay (8274 feet), and Bulusan (5100 feet) are the highest volcanoes.

CARABAO, ká'râ-bá'ō. The domestic water buffalo of the Philippines. See BUFFALO and TAMARAO.

CAR'ABAS, *Fr. pron.* ká'râ'bá', MARQUIS OF. The fortunate but not wholly obedient master of "Puss in Boots," in Perrault's fairy tale of the latter name. The name has also been used by Disraeli, in *Vivian Grey*.

CARABIDÆ (Neo-Lat. nom. pl., from Gk. *καράβος*, *karabos*, horned beetle). One of the largest families of Coleoptera. See GROUND BEETLE.

CAR'ABINEERS'. See CARBINEERS.

CARACAL, kár'á-kál (Fr., from Turk, *qara*, black + *qulag*, ear). A red-brown cat of Africa and southern Asia, related to the lynx (q.v.).

CAR'ACAL/LA. An outer cloaklike garment

worn by the Gauls. It was close fitting, with long sleeves, reached to the knees, and was slit before and behind as is a modern overcoat. The Emperor Caracalla introduced it at Rome, in lengthened form, so that it reached to the ankles. From this latter form the modern cassock derived its shape.

CARACALLA (188-217). Emperor of Rome from 211 to 217. His real name was Bassianus. He was the son of Septimius Severus and Julia Domna and was born at Lugdunum (Lyons). His father nicknamed him *Caracalla*, because he was fond of wearing a long, hooded mantle, so called in the Gallic language. In 193 his father became Emperor, and three years later, on the overthrow of Albinus, the last of the rivals to the throne. Caracalla was declared Cæsar, or heir presumptive. He was made pontifex in 197 and became co-Emperor in 198, taking the name of Marcus Aurelius Antoninus. At this time he showed no signs of that reckless, brutal nature which characterized his later years. During the rest of his father's reign Caracalla accompanied him on his expeditions, notably to Britain, where Severus died at Eboracum (York) in 211. He now returned to Rome and associated his younger brother, Geta, in the government; but, unable to endure an equal, he killed Geta in the very arms of their mother on Feb. 27, 212, and ordered his name to be erased from all public monuments. Caracalla now vented his mad rage on all the friends and adherents of his brother by a wholesale butchery, in which the great jurist Papinianus perished. In 212 he gave citizenship to all free inhabitants of the Empire; it has been held, however, that his motive was to increase revenue from the taxes on inheritances, a tax to which only Roman citizens were liable. The rest of his reign as sole Emperor was occupied largely with military campaigns on the frontiers, and in the farther East. He was killed on the road to Carrhæ, in Mesopotamia, at the instigation of Macrinus, the prefect, who succeeded to the throne.

CARACALLA, BATHS OF, or THERMÆ ANTONINIANÆ. See BATH.

CARACALU, kă'ră-kă'loo. The capital of the District of Romanati, Rumania, 30 miles southeast of Krajova. It has some fine public buildings and a domestic trade. Pop., 1899, 12,035.

CARACARA, kă'ră-kă'ră (imitation of its harsh cry). The Brazilian name of certain large, vulture-like hawks of South and Central America, which have very long, naked legs, the head somewhat crested and the cheeks bristly, the plumage chiefly black and white and handsomely arranged. They walk about on the ground, feeding on carrion, and where food is abundant gather into vast flocks. Of much service as scavengers, in the cattle-herding regions of South America, they have increased greatly and developed many interesting traits. They erect in trees or on cliffs bulky nests of sticks and leaves and lay only two eggs, heavily blotched and spotted. They constitute a sub-family of the Falconidæ, which contains three genera, *Polyborus*, *Ibycter*, and *Milvago*. The former has four species, one of which, the carancho, is the common "carrion hawk" of Argentina and Brazil, while that now most commonly called "caracara" is *Polyborus cheriway*, which ranges from Ecuador to the southern border of the United States. Their names (compare CHI-

MANGO) are imitative of their hoarse cries. Consult Selater and Hudson, *Argentine Ornithology*, vol. ii (London, 1889), and Darwin, *A Naturalist's Voyage* (London, 1860).

CARÁCAS, kă-ră'käs. The capital of Venezuela and an episcopal city, situated 6 miles south of La Guayra, its port, in lat. 10° 31' N. and long. 67° 5' W. (Map: Venezuela, D 1). The city lies in a fertile valley, 3000 feet above sea level, and enjoys a climate that is on the whole mild (temperatures ranging from 84° to 48° F.), but subject to sudden variations of temperature and humidity, and to other influences productive of malaria, biliousness, and rheumatism. Its streets are clean, although narrow and straight, crossing each other at right angles, and its principal square, the Plaza de Bolívar, with an equestrian statue of Bolívar in the centre, is surrounded by the government buildings, the university, the cathedral, and the episcopal palace. Other notable buildings are the national museum and the public library. Besides the university, there are numerous educational institutions, such as the medical school and the military school. There are also several learned societies, and associations for the promotion of agriculture and industry. Carácas does little manufacturing, but is the centre of the export trade of the district, which produces cacao, coffee, tobacco, etc. The city is the seat of a United States consular agent. Pop., 1904, c.90,000. Carácas was founded in 1567 as Santiago de León de Carácas and prospered greatly because of its favorable situation. It was twice destroyed—in 1595, when it was sacked by the English, under Preston, and in 1766, when the French put it to sack and pillage. But it continued to grow, and played an important part in the war of independence against Spain, claiming the honor of having been the first colony in South America that succeeded in throwing off the yoke of Spain. Carácas was the birthplace of Simón Bolívar. The great earthquake of 1812 killed 12,000 persons and laid half the city in ruins. The last serious shock occurred in 1900.

CARACCI, kă-răt'ché. See CARRACCI.

CARACCIOLI, kă-răt-chô'le, FRANCESCO (1752-99). A Neapolitan admiral. He entered the navy at an early age and distinguished himself at Toulon in 1793. In the year 1798 he abandoned Ferdinand and entered into the service of the Parthenopean Republic, established by the French invaders, and with a few vessels prevented the attempted landing of a Sicilian and British fleet. In 1799, when Cardinal Ruffo took Naples, Caracciolo was arrested, contrary to the terms of capitulation, sentenced to death by the Junta, and hanged on the mast of a frigate. His corpse was thrown into the sea. For Caracciolo's fate Lord Nelson, influenced by the notorious Lady Hamilton, was largely responsible. Consult Colletta, *Storia del reame di Napoli* (bk. v).

CARACTACUS, or **CARATACUS** (c.50 A.D.). A king of the Trinovantes who dwelt north of the Thames, and who were the masters of southeastern Britain when Claudius began his conquest in the year 43. When the Trinovantes were defeated and their capital, Camalodunum (Colchester), was taken by the Romans, Caractacus retreated, but kept up the struggle until 51. In that year he was overthrown in a pitched battle, his wife and children were captured, and he was delivered to the Romans by Cartimandua, Queen of the Brigantes, to whom he had

fled for refuge. Caractacus was sent to Rome, where he had to remain until his death. Tacitus in the *Annales*, bk. xii, chap. xxxvii, places an eloquent and dignified speech in the mouth of Caractacus when he stood in bonds before the Emperor.

CARACTÈRES DE THÉOPHRASTE, ká'-râk'târ' de tâ'ô'frâst'. A work by La Bruyère based on his translation of the character sketches by Theophrastus, which he extended and adapted to the customs of his own day. These studies were increased from 386 to 1100 in number in the various editions from 1688 to 1696.

CARADOC, or **CRADOCK**. A member of the Round Table in Arthurian legend. One of the 31 knights selected by Merlin to accompany Arthur to Carohaise, to help King Leodegran against King Ryance of Ireland, who was about to attack that monarch with 15 tributary kings. His wife was the heroine of the episode of *The Boy and the Mantle*.

CARADOC SAND/STONE. A heavily bedded sandstone, so named from its development at Caer Caradoc in Shropshire. With the Bala slates and sandstones, which are geologically equivalent, it constitutes the uppermost division of the Ordovician system of England. The Caradoc and Bala beds are fossiliferous and have been used largely as the basis of comparison in geological study. Their formation was accompanied by extensive volcanic action; lavas and tufas are included within their limits, and in the Snowdon region these rocks attain a thickness of several thousand feet.

CARAFE, kâ-râf' (Fr., from It. *caraffa*, a decanter, probably from Ar. *ghirâf*, vessel, *gharafa*, to dip up water). A water bottle or decanter for the table or toilet, a term long in use in Scotland, but of later introduction into England and the United States.

CARAJÁS. See **CARAYAS**.

CARAMBOLA, kâ'râm-bô'lâ (East Indian word). An East Indian fruit, of the size and shape of a duck's egg, but with five acute angles or longitudinal ribs. It has a yellow, thin, smooth rind, and a clear, watery pulp, in some varieties sweet, in others acid, of very agreeable flavor. It is often used in making sherbets, and in tarts and preserves, and is known to the British in India as the *Coromandel gooseberry*. It is one of the most universally cultivated and abundant of the fruits of India. It is produced by the *Averrhoa carambola*, a small evergreen tree or bush of the family Oxalidaceæ. The bilimbi, blimbing, or cucumber tree, so called from the shape of the fruit, is the very acid fruit of another species of the same genus, *Averrhoa blimbi*, also East Indian. Both species are now much cultivated in the tropical parts of America, the first to a limited extent in southern California. Both exhibit an irritability of leaf resembling that of a sensitive plant; they also display in a remarkable degree the phenomenon commonly known as the sleep of plants (q.v.). See **MOTOR ORGAN**; **MOVEMENT**.

CARAMEL (Fr., from ML. *calamellus*, strictly *cana mellis*, cane of honey, but considered to be dim. of Lat. *calamus*, cane). The name is applied to the dark-brown, slightly bitter, and faintly acid substance produced by the application of heat to sugar. It is likewise formed during the roasting of all materials containing sugar, such as coffee, chicory, and malt, and is

one cause of the dark color of porter and infusions of coffee. It is largely employed in the coloring of whisky, wines, vinegar, soups, gravies, etc. The name is also given to a kind of confectionery.

CARAMNASSA, kâ'râm-nâs'sâ. See **KARAMNASSA**.

CARANAIBA PALM. See **CARNAUBA PALM**.

CARANCHO, kâ-rân'chô, or **CARANCHA**, -chá. See **CARACARA**.

CAR/APA (Neo-Lat., from Guiana *caraipi*). A genus of plants of the family Meliaceæ, natives of warm climates. *Carapa guianensis*, sometimes called the Anderaba, also the carapa tree, is a large tree with beautiful shining pinnate leaves, which have many leaflets. It is a native of Guiana and the adjacent countries, where its bark has a great reputation as a febrifuge, and the oil obtained from its seeds is much used for lamps. Masts of ships are made of its trunk. The oil, which is called oil of carapa, is thick and bitter and is anthelmintic. *Carapa procera*, an African species, yields a similar oil, which is employed by the negroes for making soap and for anointing their bodies, its bitterness protecting them from the bites of insects, a purpose to which the oil of carapa is also applied in South America.

CARAPANOS, kâ-râ'pâ-nôs, **CONSTANTINE** (1840-). A Greek archaeologist. He was born at Arta and studied at Corfu and Athens. He became chief secretary of the Société Générale de l'Empire Ottoman, the first great financial institution to be established in Constantinople (1864). In 1876 he devoted himself to archaeology and promoted the investigations which led to the discovery of the ruins of Dodona, described in his *Dodone et ses ruines* (1878).

CARAQUET, kâr'â-kêt'. A port of entry in Gloucester Co., New Brunswick, Canada, on the Bay of Chaleur and on the Caraqueet Railway (Map: New Brunswick, E 1). It has a good harbor and important fishing industries. The settlement consists of Upper and Lower Caraqueet. Pop., 1901, 4074; 1911, 4621.

CARAS. An important ancient Indian tribe of Ecuador, whose culture was centred about the region of Quito. Tradition makes them come from the Pacific coast, intruding upon an earlier people, the Quitus. They worshiped the sun and the moon and venerated two culture heroes, Pacha and Eacha. The Caras were a federation of independent states rather than a monarchy after the Incasic fashion. They long resisted Quichua power. Their language has long been extinct. Rivet thinks the Cara tongue belonged to the Barbacoan stock, which he affines to the Chibchan. Consult Saville, *Antiquities of Manabi, Ecuador* (New York, 1907-10), and Verneau and Rivet, *Ethnographie ancienne de l'Equateur* (Paris, 1912), especially pp. 14-21.

CAR/AT (Fr., from Ar. *qirât*, pod, husk, carat, from Gk. *keparion*, *keration*, fruit of the locust tree, from *képas*, *keras*, horn). Originally the name given to the seeds of the Abyssinian coral flower or coral tree (*Erythrina abyssinica*). These, which are small and equal in size, having been used in weighing gold and precious stones, carat has become the designation of the weight commonly used for weighing jewels, particularly diamonds. The seeds of the carob (q.v.) tree have also been said to be the original carat weights of jewelers.

Jewelers and assayers divide the troy pound,

ounce, or any other weight, into 24 parts, and call each a carat, as a means of stating the proportion of pure gold contained in any alloy of gold with other metals. Thus, the gold of coinage, and of wedding rings, which contains $\frac{1}{24}$ of pure gold, is called 22 carats fine, or 22-carat gold. The lower standard used for watch cases, etc., which contains $\frac{1}{48}$ of pure gold, is called 18-carat, and so on. The carat used in this sense has therefore no absolute weight; it merely denotes a ratio. This, however, is not the case with the carat used for weighing diamonds and other precious stones, which has a fixed weight, and was divided into quarters, or "carat grains," eighths, sixteenths, thirty-seconds, and sixty-fourths, but since the adoption of the international metric carat is divided decimally.

This carat for many years varied in the various markets of Europe and Asia. At the beginning of the twentieth century at least 22 different carats, ranging from the Bologna carat of 188.5 milligrams to the Arabian carat of 254.6 milligrams, were in use. Accordingly dealers in precious stones in Germany in 1905 suggested an international carat based on the metric system and equal to 200 milligrams, or one-fifth of a gram (3.086 grains). This suggestion was straightway adopted by similar interests in France and other European countries and received the approval of the International Bureau of Weights and Measures. By 1912 it was in use in France, Germany, and practically all countries excepting the United States, Great Britain, Belgium, and Holland, where various carats corresponding approximately to 205 milligrams were employed, the American jeweler using a carat corresponding to 205.2 milligrams, or approximately that of the British Board of Trade and the jewelry trade of Antwerp. On Oct. 29, 1912, representatives of the American jewelry trade adopted a resolution providing for the use of the international carat after July 1, 1913, and requested the Secretary of the Treasury to employ this standard in levying the duty on imported diamonds and other gems. This recommendation was adopted by the Treasury Department, by the United States Bureau of Standards, as well as by the New York State Department of Weights and Measures, and other official agencies. By an order in council made on the recommendation of the English Board of Trade, the international metric carat of 200 milligrams was adopted for England, to take effect April 1, 1914, and the new weight has become practically universal.

CARATHEODORY, kă'ră'tă'ô'dô'rê', ALEX-ANDRE. See KARATHEODORY, ALEXANDER.

CAR AUSIUS, kă-ră'shi-tis (?-293). A Roman usurper, who made himself Emperor of Britain. He was a native of what is now Belgium and was placed by the Emperor Maximian in command of the Roman fleet at Boulogne. He used his office to secure wealth and power and was accused of conniving in the piratical expeditions of the Germans against Britain. In 286 Maximian ordered him to be put to death, but Carausius had already revolted. He went to Britain, secured the allegiance of the Roman soldiers there, and assumed the title of Emperor. For six years he maintained his position and with his ships commanded the British Channel. After the defeat of a Roman fleet in 293, Diocletian and Maximian recognized him as co-Emperor, but when Constantine was made Cæsar

he undertook the subjugation of Britain. Boulogne was taken in 293, and the same year Carausius was murdered by his chief minister, Allectus. The latter was easily conquered by Constantine in 296. Consult Gibbon, *Decline and Fall*, vol. i, chap. xiii, ed. by Bury, with notes (London, 1896), and Webb, *The Reign and Coinage of Carausius* (London, 1908).

CARAVACA, kă'ră-vă'kă. A city of Spain in the Province of Murcia, on a river of the same name, about 39 miles west by north of Murcia (Map: Spain, E 3). It is situated on the slope of a hill crowned with a fine old castle (Santa Cruz), and has broad and well-paved streets. The municipal building and the parish church, the latter an Ionic structure completed in 1600, are the more noteworthy edifices. The city is in a very fertile region and has manufactures of linen and woolen goods, brandy, soap, paper, leather, flour, chocolate, etc. Caravaca is a very old town, many ancient remains being found in the vicinity. It was held successively by the Goths, Moors, and Christians, but has occupied in history a place of comparative unimportance. Pop., 1900, 15,804; 1910, 17,349.

CARAVAGGIO, kă'ră-vă'jô. A town in the Province of Bergamo, Lombardy, Italy, 14 miles south of Bergamo. A steam tramway connects it with Monza and Milan. The site of its ancient fortified walls is now occupied by promenades, but the moat remains and is spanned by six bridges. The chief buildings are a parochial church with a lofty campanile and the church L'Apparizione della Madonna, a celebrated pilgrim resort. The artists Polidoro Caldara, Michelangelo Merisi, and Fermo Stella were born in this town and all received the surname da Caravaggio. Francesco Sforza, commanding the Milanese troops, here defeated a Venetian army in 1448. Pop. (commune), 1901, 8974.

CARAVAGGIO, kă'ră-vă'jô, properly MICHEL-ANGELO MERISI or MERISIO (improperly AMERIGI, MERIGI, or MORIGI) DA (c.1565-1609). An eminent Italian painter, founder of the Naturalistic school. He is usually called after his birthplace Caravaggio, in the Province of Bergamo, where his father was master of the household and architect to the Marquis of Caravaggio. According to most recent research, he probably studied four or five years at Milan, perhaps with one of the Campi (q.v.), then passed some time in Venice. About 1585-87 he appeared in Rome, where he was for a time associated with Cesare d'Arpino and Prospero Orsi, but he persisted in going his own way. After much vicissitude he found a patron in Cardinal del Monte, which insured his success.

His talent developed with great rapidity. Throwing all traditions aside, and appealing only to nature, he became the head of the Naturalists, in opposition to the Mannerists. He became very popular, and even the Eclecticists imitated him. But the animosities which he excited and his own passionate disposition involved him in constant quarrels, although he certainly did not provoke all the quarrels attributed to him. Thus he is said to have challenged Guido Reni, who imitated his work, to a duel, and to have chased the inoffensive Guerino from Rome. It is true, however, that he killed a comrade in a quarrel over a game, and had to leave Rome for this offense. He was protected and concealed near Palestrina by Duke Marzio Colonna. He painted for that nobleman until he went to Naples. In this city he found



CARAVAGGIO
"THE ENTOMBMENT OF CHRIST"
FROM THE PAINTING IN THE VATICAN AT ROME

an appreciative public, and from his activity there arose a Naturalistic school of great importance. He afterward went to Malta, where he painted two portraits of the Grand Master of the Knights of St. John, one of which survives in the Louvre, besides other religious pictures for the same patron. As a reward he was made one of their number, but when Caravaggio again quarreled and wounded one of the knights, they threw him into prison. The painter escaped, and was for some time occupied in the churches of Catania, Syracuse, and other Sicilian cities. He was always desirous of returning to Rome, and on having been pardoned by the Pope, in 1609, he set out from Naples for the Eternal City. But he was waylaid on the road, and died at Porto Ercole, from the effects of a wound.

Caravaggio's art was like his character—fierce in mood, impetuous in expression. His pictures are full of action and of feeling, not mere painted models, like those of Courbet (q.v.), his nineteenth-century successor. They resemble his in that they are plebeian; both sought in the common types of the people the models for their pictures, and both insisted on the exact reproduction of these types. There was, however, this great difference, that while Caravaggio saw nature with the extravagant eyes of the seventeenth century, Courbet saw it with the matter-of-fact gaze of the nineteenth. Caravaggio was a good technician in drawing, color, and brushwork, and he handled light and shade with fine effect.

His work may be best divided into two periods. In the first he did not make such prominent use of the dark shadows and high lights which characterize his later period, and which became the most prominent characteristic of the Naturalistic school. Most of the works of this period are genre pieces, executed during his stay in Rome. One of the best examples is the "Card Players," in which the artist represents a wealthy, inexperienced young man being cheated by professionals. The best example of this picture is in the Sciarra Palace, Rome, although the Dresden replica has been most reproduced. Another fine specimen of his first period is the "Gipsy Fortune Teller," in the Palazzo dei Conservatori, on the Capitoline Hill. The cunning jade seems more anxious to win the young man's heart than to attend to professional duties. The Berlin Museum possesses two charming genre pieces, "Love as a Ruler," "Love Conquered," showing an admirable mastery over the nude.

The works of his second period were mostly larger religious compositions, the result of the reputation already established by his genre productions. They aroused great opposition, especially in Rome, on account of the ordinary types which he used to portray the saints whom the Church adored. Among those which had to be removed from the churches in Rome was "St. Matthew Writing the Gospel," now in the Berlin Museum, and the admirable "Death of Mary," in the Louvre. In the latter picture the body of the Virgin looks as if it had just come from the morgue, but the expression of grief in the mourners is most affecting. His masterpiece of this category is his "Burial of Christ," painted for the church of Santa Maria in Trastevere, but now in the Vatican. This work is excellent in composition, the women are noble in expression, and the men are full of character. The body of Christ, though entirely realistic, is a beautiful representation of the nude. Rubens thought this

picture worthy to copy and it has been often engraved.

The chief galleries of Europe abound in works of Caravaggio, but not nearly all of those ascribed to him are original. By its acquisition of the Giustiniani collection, Berlin is exceptionally rich, and London has a characteristic example in "Christ and the Apostles at Emmaus." Caravaggio also painted a few portraits of great realism and force. Of his portraits of himself, the youthful specimen in the Uffizi (Florence) is noted, but his finest piece of portraiture is probably the Grand Master of the Knights of Malta, in the Louvre.

Although he had no direct pupils, Caravaggio was of the greatest influence upon the development of modern art. Even the principal pupils of the Carracci, like Guido Reni and Guercino (q.v.), studied his art, and Domenichino (q.v.) was influenced by it. He may be justly considered the founder and head of the Naturalistic school (see PAINTING), and as the advocate of the return to nature, his influence extended beyond Italy into the North, where he influenced Rubens and was the forerunner of the great Dutch masters of light and shade.

Consult: Baglione, *Le vite de' pittori* (Rome, 1649); Bertolotti, *Artisti Lombardi a Roma* (Milan, 1881); Eisenmann, "Caravaggio," in Dohme's *Kunst und Künstler* (Leipzig, 1879); Venturi, in *L'Arte*, xiii (1910); Fornone, *Michelangelo Caravaggio* (Bergamo, 1907); Schermerber, *Betrachtungen über die italienische Malerei im 17ten Jahrhundert* (Strassburg, 1906); Rolfs, *Geschichte der Malerei Neapels* (Leipzig, 1910).

CARAVAN (Fr. *caravane*, Sp. *caravana*, from Pers. *kārvān*, from OPers. *kāra*, people, army). The name given to the great assemblages of travelers which, at stated times, traverse the deserts of Asia and Africa. Most caravans are formed for the purposes of trade, the merchants associating themselves for mutual help and protection. A caravan sometimes has as many as 1000 camels, which follow each other in single file, so that it may be a mile or more in length. The most celebrated caravans are those formed by pilgrims going to Mecca, particularly those which annually assemble at Cairo and at Damascus. The latter consists of thousands of pilgrims and stands under the special protection of the Turkish Sultan. The caravan by which the Persians travel to Mecca starts from Bagdad, and is the vehicle of a very important trade. The great Indian caravan to Mecca, which started from Muscat, has been long given up. The trade between Tripoli and the interior of Africa is exclusively carried on by caravans, likewise that between Darfur and Egypt, and a considerable trade between Russia and China is still carried on by caravan. In the East, caravans in which the camels have a load of 500 to 600 pounds are called heavy caravans; light caravans are those in which the camels have only half that weight, so that the daily journeys may be longer. Heavy caravans travel from 18 to 20 miles a day; light from 22 to 25. The caravans are generally conducted with great regularity, and assemble at and start from stated places on stated days. The leader of the Mecca caravans, of which there are two principal ones each year, is called *emir-el-hadj*, i.e., prince of the pilgrims. In trade caravans a leader, who is called *karavan-bashi*, is elected by the merchants from their own number. In addition to the leader, each caravan

has its servants, guides, military escorts, and priests. Obedience is enforced by the leader in the matter of internal discipline, but in trafficking each member is independent.

CARAVAN. See **CARRIAGE**.

CARAVANSERAI, ká'rā-vān'sā-rī (Pers. *kārān*, caravan + *sarāi*, inn), or **CAR'AVAN'SERY**, or **KHAN**. An Oriental inn, resembling the *dak bungalows* of modern India, affording temporary shelter to merchants and others traveling in caravans. It is generally a very spacious, quadrangular building, its four wings inclosing a courtyard intended for the bales of merchandise and the beasts of burden and containing a well, spring, or water fountain. The interior accommodations consist of small and unfurnished rooms, rarely over 7 feet high, running about the courtyard. Some of these have no windows, but only a few narrow air holes. A large gateway, spacious enough to admit a loaded camel, leads into the inner court. When a caravanserai is too small to accommodate an entire caravan, the courtyard is used as a warehouse, while the mules or camels rest outside the gates. A porter, appointed and paid by the municipal authority of the place, is the official supervisor of the caravanserai. Aided by one or more assistants, he sees to the safety of the goods, animals, and travelers. These Eastern inns are very ancient institutions, being, in fact, the "inns" of Gen. xlii. 27, xliii. 21; and it was in the stable of some such place (there being no room for his parents in the lodging apartments) that Christ was born. These inns belong either to the government, to the church (mosques), or to private individuals. Such as are situated on the roads are usually free (save for small gratuities expected by porters), while at others a nominal fee is charged. At Cairo, Damascus, Beirut, Aleppo, and elsewhere there are some large and very handsome caravanserais built and maintained by charity when not supported through municipal pride.

CAR'AVEL, or **CAR'AVE'LA** (Sp., *ML. carabus*, a boat, Gk. *kápaßos*, *karabos*, light ship). 1. A small vessel formerly much used in Portugal. It was lateen rigged, with a single square sail on the foremast, and rarely exceeded 150 tons. 2. A small lateen-rigged fishing vessel of 10 or 15 tons used in Spain, Portugal, and the Azores. 3. A large Turkish ship of war. The name was, in Spain and Portugal, formerly applied to larger craft; the *caravel* of the fifteenth and sixteenth centuries was occasionally a ship of 200 or 300 tons' burden, with four masts, lateen rigged on three and square rigged on one, the foremast. As in vessels of the period, the poop and forecastle of a *caravel* were very high, especially the former. Two of the ships of Columbus were of the *caravel* type.

CARAVELLAS, ká'rā-vā'lās. A town in the Brazilian State of Bahia, situated on the Caravellas River, 5 miles from its mouth (Map: Brazil, K 7) and connected with the coast by natural canals. It has a good harbor and is in communication by rail with the interior. The exports consist of fish oil, coffee, and coconuts. Pop., over 4000, within the town, and in 1890 the municipality had 5482.

CARAWALA, ká'rā-wā'lā, or **CARAWILA**. See **KARAWILA**.

CAR'AWAY (Sp. *alcarahueya*, from Ar. *al*, the + *kararyā*, *karariya*, caraway plant; probably from Gk. *kápor*, *karon*), *Carum carvi*. A plant of the family *Umbelliferae*, growing wild

in Europe and in some parts of Asia. It is cultivated in Europe and in America for its aromatic seeds (carpels), which are used medicinally, and as an aromatic condiment, by confectioners, distillers, and perfumers, in the preparation of liquors, cakes, sweetmeats, scented soaps, and similar products. It depends for its aromatic properties on a volatile oil called oil of caraway, which is obtained by bruising the seeds and distilling them with water. Caraway has a branching stem 1 to 2 feet high, with finely divided leaves, and dense umbels of whitish flowers. It is easy of cultivation. For illustration, see Plate of **CAMELLIA**, ETC.

CARAYÁS, cá'rā-yás', or **CARAJÁS**, a tribe of South American Indians, situated on the Rio Araguaya and its affluents, in the Govaz country of south-central Brazil, with another section on the right bank of the lower Xingú. They probably once extended much further to the south, though Ehrenreich thinks they migrated from the north. Their chief divisions are the Carayás proper, the Chambioas, and the Javahés. They number in all between 1500 and 1750 and are decreasing somewhat rapidly. They are a primitive people and strictly monogamous. They are said to have buried their dead upright, with the head out of the ground and food placed near it. Their language forms a distinct stock. Consult Coudreau, *Voyage au Tocantins-Araguaya* (Paris, 1897); Krause, *In den Wildnissen Brasiliens* (Leipzig, 1911); Chamberlain in *Science*, N. S., vol. xxxvii (1913).

CARBAJAL, FRANCISCO. See **MEXICO, History**.

CARBAJAL, kár'bá-hál', FRANCISCO DE (1464-1548). A Spanish soldier, born in Arévalo, Avila. He is said to have been a natural son of Caesar Borgia, Duke of Valentinois (and consequently a nephew of Pope Alexander VI). After serving a while in Spain, he took service under the Gran Capitán Gonzalvo de Córdoba, and was present at the battles of Ravenna and Pavia and the sack of Rome. He went to Mexico in 1523, was sent by Cortés to Peru in 1536 to assist Francisco Pizarro, and was field marshal to Vaca de Castro in his victory over Diego de Almagro the younger, on the plain of Chupas. He joined the party of Gonzalo Pizarro in the contest against Diego Centeno and Pedro de la Gasca, was taken prisoner with Pizarro at the battle of Sacahuana (April 8, 1548), and was hanged and quartered. His extraordinary activity in this war, crossing the Andes six times and fighting countless battles, despite his more than 80 years, and his immense weight (many believed he had a familiar spirit that carried him through the air) led to his being known in history as the *Demonio de los Andes*. He was at the time of his death the most brilliant commander in Peru. "He was ruthlessly cruel, but brimming over with wit and humor, so that people said it was quite a pleasure to be hanged by him, for the sake of his witticisms on such occasions." Consult Markham, *A History of Peru* (Chicago, 1892).

CARBAJAL, kár'bá-hál', GASPARD DE, and TOMÁS JOSE. See **CARVAJAL**.

CARBALLO, kár-bá'lyó. A town in the Province of Coruña, Galicia, Spain, 20 miles southwest of Coruña (Map: Spain, A 1). It is noted for its mineral springs and baths. Pop., 1900, 13,544; 1910, 13,513.

CARBARNIDE. See **UREA**.

CARBAZOTIC ACID. See **PICRIC ACID**.

CARBIDES (*carbon* + *ide*). Compounds of

carbon and the metals or certain of the metal-loids. The most important carbides are iron carbide and calcium carbide. Molten iron unites directly with carbon to form a series of definite chemical compounds, Fe_3C , known as *cementite*, Fe_2C , Fe_7C_3 , FeC_2 , etc. The presence of these compounds, in variable quantities, in metallic iron causes important changes in certain properties of the latter; it becomes hard and brittle, and melts at a considerably lower temperature than pure iron. Next in practical importance to the carbides of iron is the carbide of calcium, now extensively employed in the manufacture of acetylene gas. When treated with water or dilute acids, most carbides are decomposed with formation of hydrocarbons. Thus, the carbide of aluminium yields methane, or marsh gas; the carbide of calcium yields acetylene. At present the carbides are made by the use of the electric furnace. In this furnace carbon is made to act on the oxide of the metal, when part of the carbon takes up the oxygen of the oxide, while another part combines with the metal. The carbides of the alkali metals, sodium and potassium, are best prepared by passing a current of pure and carefully dried acetylene gas over the melted metals, kept at a temperature of about 225°C , out of contact with the air. The name *carbides* is also applied to compounds of carbon with certain nonmetallic elements, such as silicon. The carbide of silicon is a crystalline substance remarkable for its great hardness and used, under the name of *carborundum*, for making whetstones, polishing cloths, etc. The carbides of nonmetallic elements are not attacked by acids. For a full statement of the properties of the various carbides consult Moissan, *Traité de chimie minérale* (5 vols., Paris, 1904-06). See ACETYLENE; CALCIUM CARBIDE; CARBORUNDUM; ACHESON; MOISSAN.

CARBINE, kār'bīn (Fr. *carabine*, It. *carabina*, ML. *calabra*, war engine). The firearm carried by mounted soldiers generally. It is the same in principle as the infantry rifle, but, owing to its shorter length, of more limited range than the rifle proper. It is carried, as a rule, attached to the saddle by straps, or by a pocket or bucket. In the United States army the cavalry and infantry use the same rifle. See SMALL ARMS.

CARBINEERS', or **CARABINEERS** (Fr. *carabinier*, from *carabine*). Formerly a separate and distinct type of cavalry, a distinction which no longer exists. As with many other obsolete types of military corps, the title, and in some instances the distinctive uniform, is still maintained by the various carbineer regiments throughout Europe, this distinction constituting their only real difference from other cavalry. The name is said by some authorities to have originated with the carbine, the firearm with which light cavalry was armed; by others they are said to have derived their designation from the Arabs, among whom the *Carabins* or *Karabins* were light horsemen, stationed at outposts to defend narrow passes, etc.; in action they took the place of skirmishers. Generally speaking, the name was commonly applied to light cavalry regiments, now known as hussars and lancers. See CAVALRY.

CARBO. The name of a plebeian family of the Gens Papiria at Rome. 1. GAIUS PAPIRIUS CARBO, statesman and orator. He aided Gaius Gracchus in carrying out the agrarian law of Tiberius Gracchus. (See AGRARIAN LAW.) In

13 B.C. as tribune of the people he carried a law by which voting by ballot was extended to the enactment and the repeal of laws. This law was important as tending to make the voters independent of wealthy patrons. Carbo proposed also a law making possible immediate reelection to the tribunate. This he failed to carry, because of the opposition of Scipio Africanus Minor. He was suspected as having been concerned in the sudden death of the latter in 129 B.C.; Carbo had been Scipio's bitter political enemy. In 120 he became Consul, and in that year successfully defended L. Opimius, who had killed Gaius Gracchus and was now under impeachment for having put citizens to death without a trial. Presently he was himself assailed by Lucius Crassus, the orator, and, fearing conviction, committed suicide, 119 B.C. 2. GAIUS PAPIRIUS CARBO, son of the foregoing, also statesman and orator. In 90 or 89 B.C. he, together with M. Plautius Silvanus, carried a law which conferred Roman citizenship on all persons who could prove (1) that at the time of the passage of the law their names had been enrolled as those of citizens of some *civitas federata* in Italy, that is, a state that had a formal treaty with Rome; (2) that at the time of the passage of the law they had a settled habitation in Italy, and who, within 60 days of the passage of the law, had their names inscribed on the books of one of the prætors for the year. The law, called the Lex Plautia Papiria, was a statesmanlike effort to win to Rome the loyal support of the *civitates federatæ*. It was under this law that the poet Archias claimed citizenship. Carbo supported the aristocracy and was killed by the Marian party in 82 B.C.

CARBOAZOTINE. See EXPLOSIVES.

CARBODYNAMITE. See EXPLOSIVES.

CARBOHYDRATES (Lat. *carbo*, coal + Gk. *hδap*, *hydōr*, water). A name applied in chemistry to one of three groups of substances found in great quantities in the animal and vegetable kingdoms, the other two groups being the fats and the proteids. The carbohydrates should not be confounded with the hydrocarbons; for while the latter are composed exclusively of carbon and hydrogen, the carbohydrates all contain carbon, hydrogen, and oxygen. The last-named two elements are found in most carbohydrates in precisely the same proportion in which they exist in water; so that a molecule of a carbohydrate might usually be represented as made up of x atoms of carbon and y molecules of water ($x\text{C} + y\text{H}_2\text{O}$). However, the carbohydrates contain no water as such.

The carbohydrates include the different varieties of sugar, of starch, and of cellulose. It appears strange at first that such very different substances should be grouped together: the crystalline and soluble compounds called sugars and the amorphous, mostly insoluble substances called celluloses and starches. They are all, however, connected by their common capacity of giving simple sugars called monosaccharides, when treated with dilute acids. The latter cause the addition of the elements of water, and thus the more complex carbohydrates are known to be anhydrides of the monosaccharide sugars, just as ordinary ether is an anhydride of ordinary alcohol. A carbohydrate whose molecule contains two monosaccharide molecules (minus the elements of water) is called a disaccharide; one containing three monosaccharide molecules is called a trisaccharide; the term "polysaccha-

rides" is applied to the more complex carbohydrates.

The Monosaccharides. These include glucose (grape sugar), fructose (levulose), galactose, mannose, xylose, etc. Some of them may be transformed, by the fermentative action of yeast, into alcohol. They all reduce Fehling's solution (an alkaline solution of cupric oxide). The methods for the study of their chemical constitution were first proposed by Kiliani (1885-87). Emil Fischer extended these methods and applied them to the investigation of a large number of the monosaccharides, and as a result the chemical nature of these substances is at present perfectly clear. The monosaccharides may, accordingly, be defined as follows: They are optically active chemical compounds, containing several hydroxyl groups (OH), and one carbonyl group (CO) next to one of the hydroxyl groups; some are aldehydes (aldoses), others are ketones (ketoses). They are capable of existing in numerous optically isomeric forms, and a large number of them have been prepared artificially, after the possibility of their existence had been indicated by the theories of stereochemistry (q.v.), although many of these isomers are not known to exist ready-formed anywhere in nature. See SUGARS.

The Disaccharides. These include ordinary cane sugar, milk sugar, maltose, etc., and are composed of two molecules of some one monosaccharide, or of some two different monosaccharides. Their chemical nature is, however, as yet imperfectly understood. By the action of dilute acids, or by certain processes of fermentation, the disaccharoses may be broken up into monosaccharides. Unlike the monosaccharides, the disaccharides have no reducing effect on Fehling's solution. The formula $C_{12}H_{22}O_{11}$ represents the composition of any one of the disaccharides.

The Polysaccharides. These include starch, cellulose, etc., and are chemically very complex, and as yet very little understood. Like the disaccharides, they have no effect on Fehling's solution, and yeast has no direct action on them. The composition of the polysaccharides is usually represented by the general formula $(C_6H_{10}O_5)_n$.

The carbohydrates are among the most necessary constituents of food. Their presence has been shown to be indispensable to the formation of fats, and their own value as sources of muscular energy, though smaller than that of fats, is still very considerable.

The most important carbohydrates are discussed under their special names. See CELLULOSE; GLUTEN; STARCH; SUGARS. Consult Lippmann, *Chemie der Zuckerarten* (Brunswick, 1904), which is the most exhaustive treatise on the sugars in existence.

CARBOLIC (carbon + ol + ic) **ACID**, PHENIC ACID, or PHENOL, C_6H_5OH . An important organic substance largely used as an antiseptic, disinfectant, and deodorant, as well as in the manufacture of certain dyes. It is formed when various organic substances are strongly heated, and is, therefore, found in the tar produced by the destructive distillation of coal, wood, shale, etc. Carbolic acid was discovered in 1834 by Runge, among the products obtained in the distillation of coal tar. A few years later Laurent succeeded in preparing a pure crystalline carbolic acid which he named *phenic acid*, or *phenyl hydrate*, from the Greek *phainein*—to

give light. The commercial product known as *crude carbolic acid* contains, besides phenol, various other substances derived from coal tar; it has a creosote-like odor, and is composed chiefly of phenol and cresol. The chief material from which it is made on an industrial scale is the tar obtained in the manufacture of coal gas. Carbolic acid is extracted from the fraction of coal tar which distills over between the temperatures 170° and 230° C. This portion, called middle oil, or carbolic oil, is treated with a solution of caustic soda, which combines all the phenol, but at the same time takes up a certain amount of the hydrocarbons contained in the oil. The hydrocarbons are driven off by a current of steam passed through the alkaline solution, and then the still impure sodium salt of phenol is decomposed with dilute sulphuric acid, and the crude phenol thus obtained is rectified in wrought-iron stills. The fraction passing over between 175° and 205° is subjected to further fractional distillation, the final product being practically pure phenol. At ordinary temperatures pure phenol is solid, crystallizing in large, colorless prismatic crystals that melt at 42° C. The melting point is, however, considerably lowered by the presence of minute quantities of water. The boiling point of pure phenol is 183° C. If exposed to the air, carbolic acid gradually becomes red from the presence of minute traces of lead; a permanently colorless phenol may be obtained by oxidizing the impurity with a little potassium permanganate and sulphuric acid. Carbolic acid mixes in all proportions with alcohol, ether, chloroform, glycerin, olive oil, and other organic liquids. It is but sparingly soluble in water. Aqueous solutions have a sweetish taste and leave a slightly burning sensation in the mouth. Carbolic acid has the peculiar effect of rendering the urine dark, even in such small quantities as may enter the body by absorption from surgical dressings. Taken internally in concentrated form carbolic acid acts rapidly as a poison, producing a cold and clammy skin, feeble respiration, collapse, etc. The mouth, throat, œsophagus, and stomach exhibit white eschars, or sloughs. In cases of poisoning an emetic should be administered, followed by white of egg, or a dilute solution of magnesium or sodium sulphate; soluble sulphates combining with carbolic acid to form the harmless sulphocarbolates. It is a frequent cause of death, and was formerly often employed by suicides until its sale was severely restricted by law. Whisky, an excellent antidote, should be given, by mouth, slightly diluted, and also hypodermatically for its stimulant effect. Alcohol is also a local antidote in carbolic acid burns. Ferric chloride solution is a test for carbolic acid, producing with it a violet color. The following, however, is a more sensitive test: Phenol combines directly with bromine to form tribromophenol bromide, a yellowish-white solid compound; to test a solution for phenol, bromine water may, therefore, be added, when, even if mere traces of phenol are present, a flocculent precipitate will form either immediately or in a short time. The bromine reaction is also used for the quantitative determination of phenol.

Carbolic acid is generally used to disinfect surgical instruments, bed linen, fecal discharges, walls and floors, drains, etc. The cresol contained in crude carbolic acid is itself quite efficient for these purposes. Carbolic acid is further used in itching of the skin, as a gargle,

and as a general antiseptic wash, and in its pure form as a caustic. It has been employed as an injection, in hemorrhoids, synovitis, inflamed bursæ, bubo, glandular swellings, etc. Internally it is given in flatulent dyspepsia (in the form of sulphocarbonate of soda).

CARBON (Lat. *carbo*, coal). One of the most important chemical elements. It exists in large quantities, both in the free state and in combination with other substances. It occurs uncombined in the mineral graphite, or black lead, and in the diamond, which is pure crystallized carbon. It is much more abundant, however, in a state of combination. United with oxygen, it occurs as carbonic acid in the atmosphere and in natural water, and it is similarly combined in limestone, dolomite, and ironstone. In coal it is found combined with hydrogen and oxygen, and in plants and animals it occurs as one of the component elements of wood, starch, gum, sugar, oil, bone (gelatin), and flesh (fibrin). Indeed, there is no other element which is so characteristic of plant and animal organisms as carbon. Carbon is often set free by the decomposition of organic matter. Thus charcoal forms during the imperfect combustion of wood. Many volatile organic substances, especially those rich in carbon, like benzene and acetylene, burn with a smoky flame, soot being nothing but finely divided carbon. The decomposition of vegetable refuse under water gives rise to the formation of peat. The formation of humus (black earth) is due to the carbonization of vegetable matter in moist air. At elevated temperatures carbon combines directly with oxygen, sulphur, silicon, and many metals. (See CARBIDES.) If heated with oxygen or with a strong oxidizing agent like nitric acid, carbon forms carbonic-acid gas; if the amount of available oxygen is, however, small, carbonic oxide is produced, which contains a much lower percentage of oxygen. At ordinary temperatures carbon is, like nitrogen, extremely inert; so much so that it is customary to char the ends of piles of wood which are to be driven into the ground, so as by this coating of nondecaying carbon to preserve the wood. In a similar manner the interior of wooden vessels intended to hold water during sea voyages is charred (coated with carbon) to keep the wood from passing into decay and thus to preserve the water "sweet."

Three allotropic modifications of carbon are known—viz., amorphous carbon, graphite, and diamond. The chemical identity of these substances is proved by burning them, equal quantities yielding precisely the same amount of carbonic acid, though there is a marked difference in the readiness with which they burn. Artificial amorphous carbon takes fire readily; graphite is so noncombustible that crucibles made of this material withstand a high heat for a considerable length of time; diamond completely resists most ordinary modes of setting fire to it; it can only be burned in an atmosphere of pure oxygen, by means of the electric current. The specific gravities, the hardness, and other physical properties of the three allotropic modifications of carbon are likewise very different. Many experiments have been made with the object of transforming the less valuable varieties of carbon into diamond. Only very minute quantities of diamond have hitherto been made artificially. After diamond was found to be accompanied in meteors by iron and sulphur,

the French chemist Charles Friedel endeavored to produce diamond by heating cast iron rich in carbon with sulphur, at 500° C., when a small amount of an exceedingly hard substance was produced; the quantity was, however, so slight that it was impossible to demonstrate conclusively the formation of diamond. Even by the use of the electric furnace, Moissan, in 1893, succeeded in obtaining only traces of diamond. Graphite, on the contrary, is readily formed from charcoal by heating; this is the effect, for instance, of the action of a powerful galvanic current on charcoal. Pure carbon may be prepared by charring organic substances, such as sugar, that leave no ash; to prepare it from lampblack, this substance is carefully washed with alcohol and ether and heated to a high temperature. Lampblack is largely used for making black paint, printer's ink, etc.; it is obtained by burning substances rich in carbon, such as tar, natural gas, etc. Graphite, which occurs in large quantities in nature, is used for the manufacture of pencils, after being powdered and freed from earthy matter. The carbons used in electric lighting are likewise made of graphite, which is obtained in a very dense form by mixing powdered coal with sirup to a pasty mass, giving the latter the desired shape, and applying an intense heat. A graphite far superior to the natural product in purity is now extensively made by a process invented by Acheson (q.v.). Charcoal has been utilized for making the carbonic acid used in sugar works, and for other purposes in the arts; it is employed for decolorizing solutions (see BONE BLACK); and as, when dry, it readily absorbs gases, it is used as a disinfectant and deodorant. It is also sometimes used in medicine as an antidote against vegetable poisons, such as opium, aconite, etc. Carbon is infusible and insoluble in any known liquid. The atomic weight of the element is 12, and it is denoted in chemical formulas by the symbol C. The molecule of carbon probably constitutes a complex system of atoms. See CHARCOAL; COAL; GRAPHITE; DIAMOND; CARBON COMPOUNDS; VALENCY.

CARBONARI, kār'bō-nā'rē (It., pl. of *carbonaro*, from Lat. *carbonarius*, charcoal burner, collier, from *carbo*, coal). The name of a secret political society which took an active part in the struggle for Italian liberty and unity. Its existence and character first became in some degree known in 1815. The constitution, as well as the precise objects of the Carbonari, still remains in a great measure secret, though there have been printed instructions, catechisms, statutes, and rituals of the society. Like other secret societies, it sought to dignify itself and rationally account for its existence by claiming a high antiquity, but such accounts are fabulous. There is every reason to believe that it originated during the last French régime in Naples. Botta, in his *Storia d'Italia*, states that under Murat's government the Neapolitan republicans, hating the French and King Ferdinand equally, escaped into the wild defiles of the Abruzzi and formed a secret society, naming themselves Carbonari. The peculiar phraseology of the Carbonari is taken from the vocation of charcoal burners. They were wont, for instance, to speak of "clearing the forest of wolves." The "wolves" probably meant at first foreign tyrants; but in the course of time the term was applied to the Neapolitan Bourbons. Among themselves the initiated were styled "good cousins," while the uninitiated were

"beathens" (*pagani*). The various societies do not seem to have possessed a common centre or to have been properly organized for combined action. A place of meeting was styled *baracca*, or "hut"; the external neighborhood "the forest"; and the interior of the hut was the *rendita*, or "place for selling coal." A union of several of these "huts" formed a "republic." The superior "huts" (*alte rendite*) at Naples and Salerno endeavored, but without success, to effect a centralization of the Carbonari. The society, soon after its institution, numbered from 24,000 to 30,000 adherents, and increased so rapidly in Italy that in March, 1820, it is said as many as 650,000 new members were initiated, including considerable numbers of the military and clergy.

After the restoration of the Bourbons, several secret political unions were formed in France, which in 1820 were confederated with the Carbonari. Paris was made the headquarters of a Carbonarism which, adopting all the symbolic phraseology, rules, and regulations of the Italian societies, received from the systematizing genius of the French an organic character which it had never before possessed. Written documents and communications were strictly prohibited, and treachery was punished by assassination. After the July Revolution, several of the leading French Carbonari attached themselves to the new régime, and their society was gradually dissolved. In its place the new *Charbonnerie démocratique* was founded, having for its object the establishment of a republican government, founded on the principles of Babeuf (q.v.). The endeavors of these new Carbonari to make Paris the centre of all political movements led to the secession of the Italian refugees. Napoleon III in his young republican days was a member of this society, and Charles Albert (q.v.) of Sardinia was persistently charged with being a Carbonaro. Though the Carbonari did some service in the cause of Italian unity by awakening the feeling of patriotism, it is doubtful if the results they accomplished were in proportion to their pretensions and to the vast resources which they commanded. When members were initiated in such large numbers it was inevitable that the fervor which actuated the original founders of the society should disappear. In the course of time the activity of the Carbonari degenerated into a mere spouting of symbolic catchwords and the celebration of an awe-inspiring ritual. It was as a revolt against this namby-pamby patriotism mixed with mummery that Mazzini founded the revolutionary society of Young Italy (q.v.). Consult: *Memoirs of the Secret Societies of the South of Italy, Particularly the Carbonari* (London, 1821); Saint-Edme, *Constitution des Carbonari* (Paris, 1821); Canù, *Il conciliatore e i Carbonari* (Milan, 1878); R. M. Johnston, *Napoleonic Empire in Southern Italy, and the Rise of the Secret Societies* (London, 1904); Bandini, *Giornali e scritti politici clandestini della Carboneria Romagnola, 1819-21* (Rome, 1908).

CARBONATED, or ACIDULOUS, WATERS. Natural waters containing a large amount of carbonic acid. While the quantity of the latter in spring and well water rarely exceeds 8 per cent by volume, its quantity in carbonated waters is usually as great as 30 to 60 per cent and is often much greater. The spring water at Saint-Nectaire in Puy de Dôme, France, is said

to contain in every 100 volumes as much as 400 volumes of carbonic acid. The carbonic acid exists in such waters in the free state, but is generally accompanied by either sodium bicarbonate or iron carbonate. Waters containing sodium bicarbonate are known as *carbonated alkaline* or *acidulous alkaline*; such are the famous German mineral springs at Altwasser, Pyrmont, Reinerz, Salzbrunn, and Seltzer, as well as the Navajo and Ute Springs, Manitou, Colo., the Napa Soda Springs, California, and the Hot Springs, Virginia, in the United States. Waters containing iron carbonate are called *carbonated chalybeate*, or *acidulous chalybeate*; such are the waters of the spring at Ilkeston, in Derbyshire, in England, as well as the Iron Ute Spring of Manitou, Colo., and the Rawley Springs of Virginia, in the United States. Carbonated waters are refreshing and may be useful in certain disordered conditions of the stomach; they relieve nausea, and generally increase the discharge of liquid from the system. See AERATED WATERS; CHALYBEATE WATERS; MINERAL WATERS.

CARBONATES. See CARBONIC-ACID GAS.

CARBON COMPOUNDS, or ORGANIC COMPOUNDS. A very large number of chemical substances that form the subject of the science of *Organic Chemistry*. The reason for terming the compounds of carbon "organic compounds," is that many of them could originally be obtained only from the bodies of animals and plants. For the same reason, their formation was for a long time supposed to require the agency of life. Since 1845, however, when Kolbe reproduced acetic acid artificially, every year has seen the artificial production of a host of carbon compounds; and not only have most of the natural animal and vegetable substances been reproduced artificially, but thousands of compounds have been prepared that are not known to exist ready-formed anywhere in nature. It is mainly on account of their large number that the chemistry of these compounds is treated as a branch distinct from the chemistry of the other elements. There is, however, another reason for this division of the science. Most of the compounds of carbon contain, besides carbon itself, only two or three other elements (hydrogen, oxygen, nitrogen), and those in relative quantities often the same, or very nearly the same, in different compounds. The cause of the great variety found among the carbon compounds is mainly in the great variety of ways in which the few elements are capable of combining with carbon. The theories of the constitution of carbon compounds are therefore somewhat complex, and for this reason "organic" chemistry is kept separated from and taught after "inorganic" chemistry.

Isolation of Compounds. The presence of one or more carbon compounds in a given substance may usually be detected by taking advantage of the fact that, on being heated, carbon compounds are charred, i.e., decomposed with separation of free carbon, which is readily recognized by its black color, or else give off combustible vapors. The next step in the examination of a given substance is to determine whether it consists of one single compound or of a mixture of two or more compounds. This is usually accomplished by subjecting the substance to some physical process, such as distillation or crystallization, by means of which the substance may be separated into two or more portions; if these portions are found to be identical in their physi-

cal and chemical properties, the conclusion is drawn that the substance consists of a single compound. (See CHEMISTRY.) In most cases distillation alone is capable of effecting the complete separation of compounds, and the same may be said of the crystallization of solid substances from their solutions—another process frequently employed by chemists for isolating and purifying compounds of carbon. Crystallization is, as a rule, more effective as a process of purification than distillation, and hence chemists are anxious, whenever possible, to obtain their compounds in a solid crystalline form.

Analysis. After a compound has been isolated and purified by repeated distillation or crystallization, its physical properties (especially the boiling or melting point) are carefully determined, and then it is analyzed. The analysis of carbon compounds usually involves the determination of carbon and hydrogen, often of nitrogen, and less frequently of halogens, sulphur, phosphorus, and certain other elements. Carbon and hydrogen are determined simultaneously by heating a known amount of the compound in a glass tube with copper oxide, which oxidizes all the hydrogen into water vapor and all the carbon into carbon dioxide. The process is for evident reasons termed a *combustion*. The products of the combustion are collected, respectively, in sulphuric acid and in caustic potash, and their weights are carefully determined, the percentages of hydrogen and of carbon in the given compound being calculated from those weights. A second combustion is required to determine the amount of nitrogen (q.v.) that may be present in the compound. The combustion yields the nitrogen in the free state, the gas being collected in a graduated tube, which shows the volume produced, and from this the percentage, by weight, of nitrogen in the given compound is found by a simple calculation. A direct determination of oxygen is unnecessary; after the percentages of carbon, hydrogen, and nitrogen have been determined, that of oxygen becomes evident. Halogens may be generally determined by heating the given compound with solid silver nitrate and fuming nitric acid in a sealed glass tube; all halogen thus appears in the form of silver-halogen salt, which is washed, dried, and weighed. In solid substances, both halogens and sulphur may be rapidly and accurately determined by mixing the substance with pure sugar and sodium peroxide and exploding the mixture in a steel crucible of a certain form: the halogen then appears in the form of soluble salts of sodium, sulphur appears as sodium sulphate. In the case of organic compounds of silver the amount of the latter may often be determined by simply heating a known quantity of the compound in a crucible; the metal then remains behind, as such, and is weighed directly, while the rest of the compound burns away. The amount of sodium or potassium in an organic compound may be determined by heating a known quantity of the latter with strong sulphuric acid, pure sodium or potassium sulphate being thus produced, and from the weight of this the percentage of metal in the compound is readily calculated. The determination of phosphorus and other elements that may sometimes be present in carbon compounds need not be described here, the purpose of the present sketch being merely to convey a general idea of the ways in which it is possible to ascertain the composition of

organic substances, and not to give detailed specific information; such information should be sought in special works on chemical analysis.

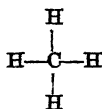
Molecular Formulas. After analysis has shown the percentage composition of a substance, the next step is to determine its molecular formula. For this purpose the percentages of the constituent elements must, first of all, be expressed in terms of their atomic weights. Let, for example, an analysis of pure acetic acid give the following results: carbon, 39.9 per cent; hydrogen, 6.7 per cent; and oxygen, 53.4 per cent. Since the atomic weights of the three elements are, respectively, 12, 1, and 16, the analytical results $39.9 : 6.7 : 53.4$ are written in the form $(3.33 \times 12) : (6.7 \times 1) : (3.34 \times 16)$, or, using the symbols of the elements to denote their atomic weights, in the form $3.33C : 6.7H : 3.34O$. Allowing for the errors of analysis, it is therefore evident that, for every atom of carbon, acetic acid contains 2 atoms of hydrogen and 1 atom of oxygen—a relation expressed by any one of the formulas CH_2O , $C_2H_4O_2$, $C_3H_6O_3$, etc. According to the first of these formulas the molecular weight of acetic acid would be 30 (i.e., $12 \times 1 + 1 \times 2 + 16 \times 1$); according to the second it would be 60 (i.e., $12 \times 2 + 1 \times 4 + 16 \times 2$); according to the third it would be 90, etc. Now, according to Avogadro's rule, the molecular weight of a compound is twice as great as the density of its vapor (compared with hydrogen). Therefore, in order to fix the molecular weight of acetic acid, its vapor density must be determined; and this may be done by one of the methods described in the article MOLECULES—MOLECULAR WEIGHTS. The vapor density being found to be about 30, the molecular weight is taken to be 60, and hence the formula $C_2H_4O_2$ is accepted as representing a molecule of acetic acid.

Chemical Constitution. The molecular formula of a compound represents its composition and its smallest relative reacting weight. It is not, however, altogether characteristic of the compound, for numerous cases are known in which a number of different compounds are represented by one and the same molecular formula. Thus, both ordinary alcohol and dimethyl ether (a substance that may be obtained from wood alcohol) are represented by the formula C_2H_6O ; five compounds, viz., ordinary ether and the four different substances called butyl alcohols, are found to have in common the formula $C_4H_{10}O$, etc. Such compounds are said to be *isomeric*, or, more strictly, *metameric*, the term "isomeric" being often extended to include also the so-called *polymeric* compounds, i.e., those which have the same relative composition but not the same molecular weight, such as acetylene, C_2H_2 , and benzene, C_6H_6 . (Another kind of isomerism may be found discussed in the article STEREO-CHEMISTRY.)

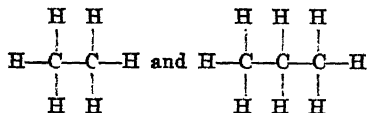
The isomerism of carbon compounds shows plainly that the composition of a substance does not entirely determine its chemical individuality. For two or more molecules composed of the same kind and number of atoms may represent very different compounds. It is therefore evident that the character of a compound must depend to a great extent also upon the manner in which the atoms are held in combination within its molecule. This, at least, is the only possible explanation that presents itself to the mind, assuming that substances are really made up of atoms and molecules; and without this assump-

tion, i.e., without the atomic hypothesis, isomerism could not be explained at all. After, therefore, the composition and molecular weight of a newly isolated compound have been determined, a further and much more difficult problem remains to be solved; viz., to determine the *chemical constitution* of the compound, i.e., the manner in which the atoms are arranged in its molecules. This problem is solved by combining the results of a careful study of the chemical and physical properties of the compound with a theoretical assumption first induced independently by Kekulé and Couper. The following paragraphs may convey an idea as to how this is done.

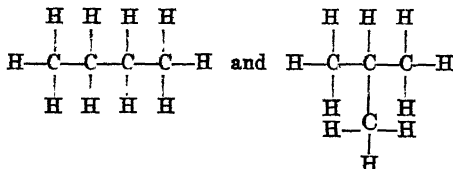
Graphical Formulas. The theoretical assumption just referred to is (1) that an atom of carbon is quadrivalent, i.e., has four times the combining capacity of an atom of hydrogen, and therefore can hold in combination four univalent atoms like those of hydrogen and chlorine, or two divalent atoms like those of oxygen; (2) that two or more carbon atoms may be directly combined with one another and may thus partly satisfy one another's combining capacity. This assumption, together with a knowledge of the valencies (combining capacities) of other elements, makes it easy to determine a priori the several different combinations that are possible with a given set of atoms, each arrangement being represented by a scheme, called a graphical formula, in which the atoms are represented by the chemical symbols of the elements, and their combining capacities by dashes that link together the symbols. The set of atoms CH_4 can be represented, on the above assumption, by only one graphical formula, viz.,



The sets C_2H_6 and C_2H_4 can likewise be represented each by only one graphical formula, viz.,



The set C_3H_8 can be represented by two different graphical formulas, viz.,



Similarly, the set C_3H_{12} can be represented by three different graphical formulas; the set C_4H_{14} by five formulas, etc.

When a compound is discovered whose molecular formula can be represented by only one such graphical scheme, the case is simple, and the structure of the molecule becomes known at once. Further, in such cases the inference from the theory is that only one compound of the given molecular formula is capable of existence. In this manner, for instance, the theory gives us the constitution of marsh gas, CH_4 , of ethane, C_2H_6 (a constituent of coal gas), of propane, C_3H_8 , etc.; the verdict of the theory being,

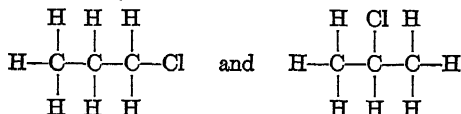
further, that only one compound CH_4 , only one compound C_2H_6 , and only one compound C_3H_8 , are capable of existing. The fact that the most careful researches have actually led chemists to the discovery of one, and only one, compound corresponding to each of these molecular formulas speaks strongly in favor of the structural theory. Again, in cases in which more than one graphical formula can be constructed from a given set of atoms, the number of compounds actually known is generally the same as the number of formulas. Thus, we have seen that two different structural formulas correspond to the molecular formula C_3H_{12} ; and, as a matter of fact, two, and only two, compounds of the formula C_3H_{12} can be obtained, viz., the substances known, respectively, as butane and isobutane, which have the same composition and the same molecular weight, yet differ considerably in their physical and chemical properties. Similarly, three different compounds of the formula C_4H_{12} are known, five different compounds of the formula C_5H_{14} , etc. In cases in which the number of isomeric compounds actually known was less than the number indicated as possible by the structural theory, earnest research has finally led to the discovery of the wanting isomerides.

The correspondence between the chemical properties of a compound and the relations exhibited by its graphical formula is usually capable of experimental demonstration. In the case of marsh gas the graphical formula is symmetrical, because the doctrine of valency assumes no difference between the several valencies of an atom. We may, accordingly, expect that the four portions of hydrogen contained in the compound exercise precisely the same function and are in all respects identical. If there were two different positions in the graphical formula, which we will call positions A and B, then we could obtain, for example, one derivative by substituting chlorine for hydrogen in position A while leaving hydrogen in position B; and we could obtain a different derivative by substituting chlorine in position B while leaving hydrogen in A. In other words, two different mono-chloro-substitution products of marsh gas would be possible. But the mono-chloro-substitution product has been obtained by many different methods, and the product was always found the same. All efforts to produce two different derivations have failed. The conclusion is that the several portions of hydrogen contained in marsh gas have really the same function. Henry has furnished a direct experimental demonstration of this principle, having employed methods by which the NO_2 group, for instance, could be made to change its place within the marsh-gas molecule: the nitro-methanes (CH_3NO_2) obtained by these methods were identically the same, although the NO_2 in them occupied demonstrably different positions.

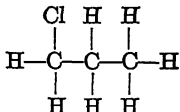
When we examine the graphical formula of ethane, C_2H_6 (see above), we find again that the several positions of the hydrogen atoms are identical: each hydrogen atom is, namely, attached to a carbon atom to which two more hydrogens and one CH_3 group are linked at the same time. If we should substitute chlorine in the place of one of the hydrogen atoms, we should—the formula tells us—obtain the same derivative, no matter which particular portion of the hydrogen is displaced. In this case, too, different and ingenious methods have actually been employed by chemists, with a view to displacing

different portions of the hydrogen by chlorine and thus possibly producing two different mono-chloro-substitution products. Yet one, and only one, such product could be obtained.

Applying the same method to the graphical formula of propane, C_3H_8 (see above), we find that there are two different hydrogen positions in it; so that two other formulas can be derived from it by substituting a chlorine atom in place of one hydrogen atom, viz.,



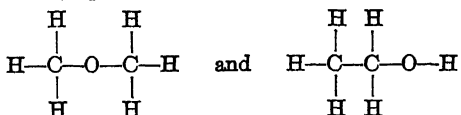
The difference between the two formulas, expressed in words, is as follows: In the first formula the chlorine is linked to a carbon atom to which two hydrogens and one C_2H_5 group are linked at the same time; in the second formula the chlorine is linked to a carbon atom to which one hydrogen atom and two CH_3 groups are linked at the same time. These are the only possible cases. If we consider a formula like the following,



which may seem, at first sight, to differ from either of the above two formulas, we have no difficulty in observing that it is characterized precisely as the first of those formulas; viz., its chlorine is linked to a carbon to which two hydrogens and one C_2H_5 group are linked at the same time. In general, a graphic formula is not meant to convey an image of the configuration of the atoms within a molecule; all it is expected to show is what atoms and groups of atoms exist in the molecule and how they are combined with one another. If we now turn to the facts of experimental chemistry, we find again that chemists have really been able to prepare two, and only two, mono-chloro-propanes having in common the molecular formula C_3H_7Cl , yet differing considerably in their properties.

The number of examples thus showing the perfect correspondence between theoretical formulas and the results of experimental investigation might be multiplied almost indefinitely. A further question, however, remains to be answered: Supposing two or more graphical formulas correspond to the same molecular formula, and the several thus possible compounds have actually been prepared, how do we know which formula corresponds to which compound?

This question is usually answered by a study of the reactions and methods of preparing the compounds. The two substances di-methyl ether and ordinary alcohol may serve as an example. Both have the same molecular formula, C_2H_6O . On the other hand, the set of atoms making up this molecule may be represented by two different graphical formulas, viz.,



Now, an experimental investigation of the alcohol reveals the following facts:

1. By the action of metallic sodium alcohol is transformed into a compound represented by the formula C_2H_5NaO . The molecular formula of the alcohol being C_2H_6O , it is evident that in this transformation one-sixth of the hydrogen contained in the alcohol is replaced by sodium. No matter how great an excess of sodium is used, no more than one-sixth of the hydrogen can thus be replaced. The transformation therefore speaks in favor of assigning to alcohol the second of the above graphical formulas, because the first shows no difference whatever in the relative positions of the several hydrogen atoms, and only the second formula shows one hydrogen atom in a different position from the other five hydrogens.

2. By the action of phosphorus penta-chloride one-sixth of the hydrogen, together with all the oxygen contained in the alcohol, is replaced by chlorine, according to the following equation:



This transformation, too, speaks in favor of assigning to the alcohol the second of the above graphical formulas, for it shows that one-sixth of the hydrogen is so intimately associated with the oxygen that they readily leave the compound together. And as, further, metallic sodium refuses to combine with the mono-chloro-ethane produced by the transformation, we conclude that the portion of the hydrogen of alcohol which is replaceable by sodium must be the same as the portion which we have just seen to be intimately associated with oxygen. That portion is evidently represented in the graphical formula by the hydrogen atom of the hydroxyl group OH.

Since, besides the two transformations just considered, all other reactions of ordinary alcohol bring out the perfect correspondence between the chemical properties of this substance and the relations exhibited by the second graphical formula, there remains no doubt as to which of the two formulas should be assigned to alcohol. But then the first formula remains the only possible one for our ether. The correspondence between the ether and the graphical formula thus chosen to represent it is, just as in the case of the alcohol, brought out by a number of reactions, but these cannot be discussed here. Suffice it to mention that the ether reacts neither with metallic sodium nor with phosphorus pentachloride; which indicates that the ether does not, like the alcohol, contain a hydroxyl group OH. The graphical formula shows the same thing very plainly.

Radicles. The example considered in the preceding paragraphs has led us, among other things, to the conclusion that a molecule of ordinary alcohol contains a hydroxyl group OH. The conclusion was based on the fact that a portion of the hydrogen of alcohol and the whole of its oxygen were seen to leave the compound together, while the rest of the molecule remained unchanged. The molecule of alcohol, C_2H_6O , is accordingly conceived as consisting of two atomic groups, C_2H_5 and OH, the constituent atoms of which tend to hold firmly together, although, of course, they are not altogether incapable of being separated. Such atomic groups, behaving during many transformations of the compound as if they were just single atoms, are called *radicles*.

An example may serve to show how the smallest radicles present in a given compound are de-

terminated by its chemical reactions. Let the problem be, To determine the atomic groups in a molecule of acetic acid, $C_2H_4O_2$. To solve the problem, acetic acid is caused to undergo a series of transformations and the following facts are brought to light:

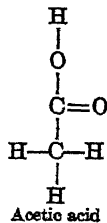
1. By the action of phosphorus penta-chloride, acetic acid, $C_2H_4O_2$, is readily transformed into acetyl chloride, whose formula is C_2H_3OCl . In this reaction an atom of hydrogen and an atom of oxygen are together replaced by an atom of chlorine. We therefore conclude that acetic acid, like alcohol, contains a hydroxyl group, OH .

2. By passing chlorine gas into hot acetic acid exposed to the direct action of sunlight, a compound called tri-chloro-acetic acid is obtained. When boiled with water, this compound is split up and chloroform is produced. Chloroform has the formula CCl_3H and hence evidently contains the group CCl_3 . The formation, by a simple reaction, of a compound containing the group CCl_3 , out of tri-chloro-acetic acid, indicates that this acid itself must contain the group CCl_3 —a view fully confirmed by other reactions. And since the molecule of tri-chloro-acetic acid, $C_2HCl_3O_2$, contains three chlorine atoms altogether, it is evident that tri-chloro-acetic acid contains no chlorine but what is combined in its CCl_3 group.

3. When tri-chloro-acetic acid is treated with nascent hydrogen, all of its chlorine is replaced by hydrogen and acetic acid is reobtained. Since tri-chloro-acetic acid was just shown to contain no chlorine outside its CCl_3 group, it is evident that the substitution of hydrogen for chlorine must result in the formation of the group CH_3 . The resulting compound, i.e., acetic acid, must therefore contain a methyl group CH_3 .

4. From the above it is clear that acetic acid contains the radicles OH and CH_3 . Subtraction of these from the entire molecule, $C_2H_4O_2$, leaves the group CO , which is evidently the third and last group contained in acetic acid.

We may, therefore, assign to acetic acid the *rational*, or constitutional, formula $CH_3CO.OH$. And, remembering that according to the structural hypothesis a carbon atom is quadrivalent, and two or more carbon atoms can be linked to each other in a molecule, we can, further, combine the three radicles of acetic acid into the following graphical formula:

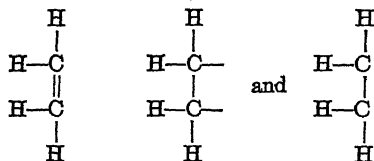


It is easy to see that although this is not the only possible graphical formula corresponding theoretically to the molecular formula of acetic acid, $C_2H_4O_2$, a knowledge of the radicles, derived by experimental investigation, eliminates the other possibilities and leaves no doubt as to what graphical formula must be accepted as representing the arrangement of the atoms within a molecule of acetic acid. Numerous facts might be cited in further support of this formula. For example, in the formula three hydrogens are seen to be linked to carbon immediately, while the fourth hydrogen is linked to carbon

through oxygen. The formula thus teaches that one of the four hydrogen atoms must have a different function from the other three hydrogens. But this is also the verdict of experiment. In fact, when acetic acid combines with alkalis to form the corresponding acetates, it is found that no matter how great the excess of alkali employed, one-quarter, and only one-quarter, of the hydrogen of acetic acid can be replaced by metal, which shows that the replaceable quarter of the hydrogen has a different function from the other three-quarters. In analogous ways, a correct graphical formula, constructed from a given set of facts with the aid of the structural hypothesis, is always found to agree with any other fact dependent on the nature of the compound, and this agreement permits the trained chemist to foretell what the principal chemical properties of a compound must be, by examining its graphical formula.

Unsaturated Compounds. Thus far we have referred only to compounds in which the valencies of the several atoms are completely satisfied, so that the molecules are incapable of taking on any more atoms. Thus, in marsh gas, CH_4 , the four valencies of the carbon atom are evidently satisfied by four atoms of hydrogen. In ethane, C_2H_6 , three valencies of each carbon atom are evidently satisfied by hydrogen atoms, while the fourth valency of each carbon atom is satisfied by the other carbon atom. Compounds thus containing the maximum possible number of atoms of hydrogen, or of other elements, are said to be *saturated*. Many other compounds, however, are known, in which this is not the case. Thus, while ethane, C_2H_6 , contains six hydrogen atoms, the gaseous compound known as ethylene contains only four hydrogen atoms in combination with two atoms of carbon, the formula of ethylene being C_2H_4 .

Three different graphical formulas might represent a molecule of ethylene; viz.,



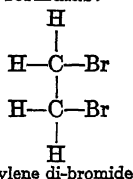
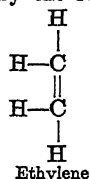
According to the first, two valencies of each carbon atom are satisfied by the other carbon atom. According to the second, one valency of each carbon atom remains unsatisfied. According to the third, the carbon atom is not quadrivalent, but tri-valent. Now, the last two formulas might be rejected in view of the following fact: A great deal of ingenuity has been spent, by some of the most celebrated organic chemists, in efforts to produce a compound of molecular formula CH_2 , the existence of which would prove, either that one of the valencies of a carbon atom may remain unsatisfied, or that carbon may occur in the tri-valent state; but all such efforts have invariably failed. The view corresponding to the first of the above graphical formulas has therefore been universally adopted, viz., that in ethylene, and in similar compounds, carbon atoms satisfy two of each other's valencies. This view is further strongly supported by the facts of what is now termed "geometrical isomerism," a discussion of which may be found under **STEREOCHEMISTRY**. Nevertheless, in recent years these views have been losing something of their original rigidity. For while the substance CH_2

has not been isolated as yet, and perhaps never will be, an analogous substance, $C(C_6H_5)_3$, or



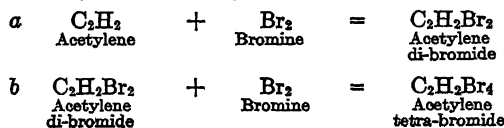
in which carbon is obviously tri-valent, has actually been prepared by Gomberg. Further, certain compounds (e.g., fulminic acid) even appear to contain di-valent carbon. These matters will be discussed in the article VALENCY. For the purposes of the present sketch it will be best to adhere to the double-bonded formula of ethylene, which is still generally used.

The formula, then, of ethylene suggests that the molecule of this compound would not be broken up if one of the two bonds between the atoms of carbon were dissolved, and two univalent atoms of some element were linked on by the two carbon affinities thus set free. As a matter of fact, ethylene combines directly with bromine and certain other elements, forming what is termed "additive compounds," the term suggesting that the atoms—say, of bromine—join the molecule of ethylene without displacing anything in it. Ethylene and its additive compound with bromine are represented, respectively, by the following two formulas:

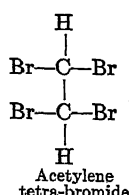
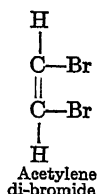
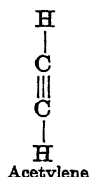


In cases like that of ethylene, the correspondence between theory and experiments is again perfect. Whenever, namely, the formula of a compound is found, by the structural hypothesis, to contain a double bond between two carbon atoms, the compound represented by the formula is invariably found to be capable of forming additive products. Compounds like ethylene are, for obvious reasons, termed *unsaturated compounds*. In view of the perfect correspondence between theory and fact, such compounds may be defined either theoretically or empirically, as follows: (1) unsaturated compounds are compounds in whose molecules there is at least one pair of carbon atoms linked by a double bond; or else, (2) unsaturated compounds are compounds capable of forming additive products with bromine or other elements, i.e., capable of uniting with bromine without at the same time losing any of their own constituents.

The term *doubly unsaturated compounds* is often applied to acetylene and its derivatives, whose formulas are found to contain carbon atoms linked to each other by a triple bond, while the compounds themselves are found capable of taking on twice as much bromine as the corresponding quantities of compounds like ethylene. Further, in doubly unsaturated compounds this formation of additive products with bromine or other elements is found to take place in two steps, as is shown, in the case of acetylene, by the following chemical equations:

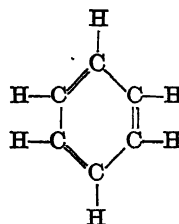


The following graphical formulas exhibit clearly the relation between the molecules of acetylene and of its additive products with bromine:



An important property of acetylene and many of its derivatives is their capacity for forming certain metallic compounds. (See ACETYLENE.) By this property many doubly unsaturated compounds may be readily distinguished from the unsaturated compounds of the ethylene series.

Benzene and its Derivatives. One of the most important of the compounds of carbon is benzene (q.v.), a liquid hydrocarbon found in coal tar. Thousands of substances are derived from benzene, thousands find extensive application in the arts. (See COAL-TAR COLORS.) An exact knowledge of the constitution of benzene is therefore highly desirable for theoretical as well as for immediate practical reasons, and so chemists have now for many years diligently searched for a graphical formula that might be in perfect correspondence with all the chemical properties of benzene. A perfect formula has not as yet been devised. Nevertheless, four different formulas, each of which exhibits well some of the properties of benzene, have been proposed and are commonly referred to, respectively, as "Kekulé's formula," "the prism formula," "the diagonal formula," and "the centric formula." The last of these is now supposed to be the best, but the first is still commonly used by chemists and therefore requires explanation in the present sketch. It is as follows:

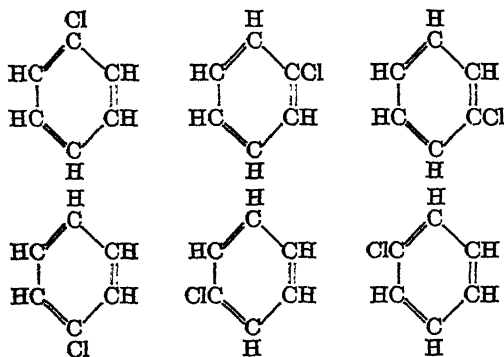


Kekulé's formula for benzene

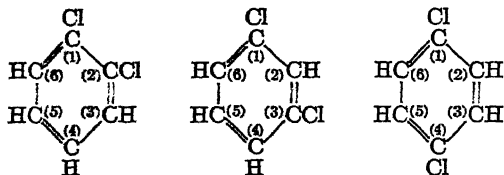
Unlike the formulas already considered in this article, the formula of benzene has its carbon atoms arranged, not in the form of a chain, but in a ring, with alternating single and double bonds between the atoms. The complete demonstration of this formula formed one of the most beautiful chapters of organic chemistry. Nothing astonishes the young student more than to find that in this demonstration an atom of bromine, substituted for one of the hydrogen atoms of benzene, is made to travel around the molecule exchanging places successively with each of the hydrogen atoms, and that this migration of the bromine atom is demonstrated beyond the slightest possibility of doubt. The demonstration cannot be repeated here, and an account of it must be sought for in one of the larger works on organic chemistry (or consult Marckwald's lecture on the theory of benzene published in Ahrens's *Sammlung chemischer und chemisch-technischer Vorträge*, Stuttgart, 1897). What

requires explanation in the present article is the isomerism of derivatives of benzene and the choice of the particular formula corresponding to each of a given set of isomeric compounds.

Kekulé's formula is based principally on two facts: 1. When one hydrogen atom of benzene is replaced by one atom of some other element, only one product is obtained; thus, only one mono-chloro-benzene, C_6H_5Cl , can be prepared. 2. When two hydrogen atoms of benzene are replaced by two atoms of some other element, three different products may be obtained; thus, three different di-chloro-benzenes, $C_6H_4Cl_2$, can be prepared. Corresponding to the first of these facts, the six hydrogen atoms occupy identical positions in Kekulé's formula, so that only one formula can be obtained by substituting, say, a chlorine atom for a hydrogen atom; for the following formulas are evidently identical:



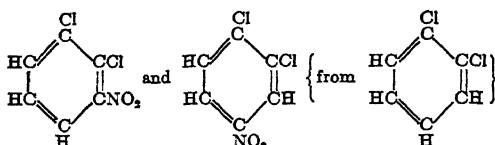
The second of the facts just mentioned may be found to be expressed by Kekulé's formula, by examining all the imaginable arrangements that could be made in the formula by substituting two atoms, say, of chlorine for two of its hydrogen atoms. It is thus easy to find that only three different formulas can be constructed, as follows:



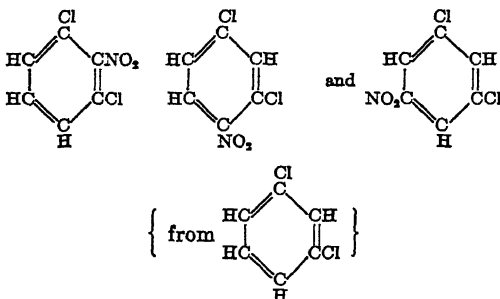
The position (1, 2) of the chlorine atoms in the first of these formulas is called the *ortho*-position; the position (1, 3) in the second formula is called the *meta*-position; the position (1, 4) of the third formula is called the *para*-position. Any other imaginable position would really be identical with one of these three; thus the position (2, 3) is found to be the same as the position (1, 2); the position (1, 5) is the same as the position (1, 3), etc. The three compounds corresponding to our three formulas are called, respectively, *ortho*-dichloro-benzene, *meta*-dichloro-benzene, and *para*-dichloro-benzene, and may be denoted as follows: $o\text{-C}_6\text{H}_4\text{Cl}_2$, $m\text{-C}_6\text{H}_4\text{Cl}_2$, and $p\text{-C}_6\text{H}_4\text{Cl}_2$; or as follows: $C_6H_4Cl_2$ (1, 2), $C_6H_4Cl_2$ (1, 3), and $C_6H_4Cl_2$ (1, 4).

But then how do we know which of these compounds is *ortho*, which is *meta*, and which is *para*? In other words, being given three different compounds and three different formulas corresponding to them, how do we decide which

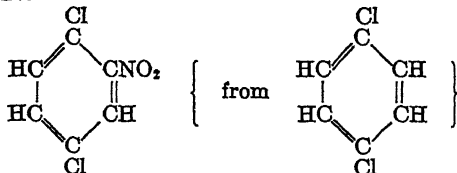
formula is to be assigned to which compound? Several different methods are employed in deciding this important question—important because it presents itself in the case of thousands of valuable compounds. One of these methods, characterized by great simplicity, certainty, and elegance, was discovered by Körner. It is based on the following considerations. When an *ortho*-di-substitution product like *ortho*-dichloro-benzene is transformed into a tri-substitution product by the introduction of some group, say, the nitro-group NO_2 , *two*, and only two, different compounds may be obtained according to the formula of benzene, viz.:



A *meta*-di-substitution product would similarly yield *three*, and only three, tri-substitution products, as follows:



Finally, a *para*-di-substitution product would yield *one*, and only one, tri-substitution product, viz.:



In order, therefore, to determine whether a given di-substitution product is *ortho*, *meta*, or *para*, the given compound may be transformed into a tri-substitution product. If it is then found that the tri-substitution product is capable of existing in two isomeric modifications, the conclusion is that the particular di-substitution product from which it is derived corresponds to the *ortho* formula. Similarly, if the number of isomeric tri-substitution products is three, the corresponding di-substitution product is seen to be necessarily a *meta*-compound. And if only one tri-substitution product can possibly be obtained from a given di-substitution product, the latter is concluded to be a *para*-compound.

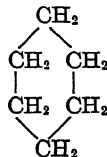
Organic Reactions. Now, in reality it would be a tremendous undertaking to go through a demonstration of the kind just described, in the case of every newly discovered compound. In many cases years would have to be spent in determining the constitution of a single compound. Chemists therefore make use of an additional working principle—a generalization made from the study of a large number of organic reactions.

According to this, when one compound is transformed into another by some simple reaction, the molecule—at least the principal part of it—remains unchanged. Once, therefore, the constitution of a certain number of substances has been determined, say, by Körner's method, the constitution of any new substance derived from one of them by a simple reaction becomes evident by the very fact that it is derived from a substance of known constitution, or by the fact that it may be transformed into a substance of known constitution; and it is in this manner that the constitution of a great majority of carbon compounds has been brought to light. Thus, if the di-chloro-benzene, $C_6H_4Cl_2$, which is shown by Körner's method to be an *ortho*-compound, were transformed into dioxy-benzene, $C_6H_4(OH)_2$, the latter, too, would be assumed to be an *ortho*-compound. It is easy to see that this principle is at the basis of Körner's method itself, and it may be considered as one of the fundamental principles of organic research.

The reason that Kekulé's formula for benzene is not adopted in a final manner, and other formulas have been proposed, is that benzene does not act as an unsaturated compound (as the formula shows it to be) and refuses to combine readily with bromine. A remedy for this discrepancy between the formula and the actual behavior of the compound is furnished by Thiele's general theory of "residual valencies," which will be discussed in the article VALENCY.

Classification of Carbon Compounds. The innumerable compounds that are said to be derived from benzene all resemble the latter in certain chemical properties—a fact which is in accordance with their formulas having in common the benzene ring, or "benzene nucleus," consisting of six carbon atoms. It is therefore convenient to treat the benzene derivatives, otherwise called "aromatic compounds," separately from the rest of the compounds of carbon; and hence the division of organic compounds into *fatty* (or aliphatic) and *aromatic*. Just as the aromatic compounds may be considered as derivatives of benzene, the fatty compounds may be considered as derivatives of methane, or marsh gas, the simplest of the compounds of carbon; and while the aromatic compounds are characterized by having in their formulas a nucleus of carbon atoms arranged in a ring, or *closed* chain, the fatty compounds have graphical formulas in which the carbon atoms are arranged along straight lines, or *open* chains. However, in spite of this constitutional distinction between fatty and aromatic compounds, it must be remembered that the compounds of the two classes are more or less closely related, and that compounds of one of these classes may, by suitable methods, be transformed into compounds of the other class. A classical example of such a transformation is Berthelot's celebrated synthesis of benzene itself from acetylene, effected by simply passing the latter through red-hot tubes. Again, the subdivisions of the two great classes present a notable parallelism. Thus, corresponding to the *fatty* acids, alcohols, aldehydes, ketones, etc., there are also *aromatic* acids, alcohols, aldehydes, ketones, etc. In recent years a third series of organic compounds, the so-called *hydro-aromatic series*, has attained an importance comparable with that of the two older series. The hydro-aromatic compounds may be considered as derived from hexahydro-benzene (hexamethylene or cyclo-hexane),

C_6H_{12} . The constituents of the essential or volatile oils so extensively contained in plants belong mostly to this series. The graphic formula of hexahydro-benzene itself is:



Just as the division of organic compounds into the series mentioned above is based on a difference in their chemical constitution, so is the further classification of the compounds belonging to each of the two great classes based on constitutional similarities and dissimilarities.

The most important classes of carbon compounds, as well as a large number of individual compounds that are interesting because of the important rôle that they play in the bodies of animals and plants, or because of their useful applications in medicine and the arts, are described under their special names. See HYDROCARBONS; ALCOHOLS; ETHERS; ALDEHYDES; KETONES; ACIDS; ESTERS; AMIDES; AMINES; ORGANO-METALLIC COMPOUNDS; CARBOHYDRATES; PHENOLS; DIAZO COMPOUNDS; ETC. Besides the derivatives of methane, benzene, and hexahydro-benzene, the derivatives of naphthalene, anthracene, pyridine, and quinoline (qq.v.) deserve mention here. For history and bibliography of organic chemistry, see CHEMISTRY.

CARBONDALE. A city in Jackson Co., Ill., 95 miles southeast of St. Louis, Mo., on the Illinois Central (Map: Illinois, C 6). It is the seat of the Southern Illinois Normal University. The city is a division point of the Illinois Central, and has flour mills, ice and brick plants, bottling works, and a large railroad-tie preserving establishment. It is in an agricultural and coal-mining region, and ships coal, fruit, flour, live stock, etc. Carbondale adopted the commission form of government in 1910. Pop., 1900, 3318; 1910, 5411.

CARBONDALE. A city in Lackawanna Co., Pa., 16 miles northeast of Scranton; near the head of the Lackawanna River, and on the Erie, the Delaware and Hudson, and the New York, Ontario, and Western railroads (Map: Pennsylvania, K 3). The city has a public library, emergency hospital, hospital for the criminal insane, city private hospital, fine Federal building, and a small park in the heart of the city, containing a soldiers' monument. It is in the centre of one of the most important anthracite coal-mining districts in the State, and has silk and knitting mills, foundries and machine shops, car shops, glass factories, metal works, etc. Settled in 1824, Carbondale was incorporated in 1851. It has adopted the commission form of government. Pop., 1900, 13,536; 1910, 17,040; 1920, 18,640.

CARBON DISULPHIDE, or BISULPHIDE (carbon + disulphide, from Gk. *di-*, double + *sulphide*, and *bisulphide*, from Lat. *bi-*, double + *sulphide*), CS_2 . A compound of carbon and sulphur, analogous to carbon dioxide, whose formula is CO_2 . It may be prepared by passing the vapors of sulphur over charcoal kept at a red heat. On a large scale it is prepared as follows: A cast-iron cylinder containing charcoal is placed in a furnace and heated to the re-

quired temperature. The cylinder is provided with two tubes, through one of which sulphur vapors or pieces of sulphur are introduced, while the other serves as an exit for the vapors of carbon disulphide, which are liquefied in a suitable condenser. Pure carbon disulphide is a heavy, colorless liquid of a rather pleasant ethereal odor; the ordinary preparations, however, have a most sickening smell, owing to the presence of impurities. The specific gravity of the purified compound at 0° C. is 1.293. It has a high refracting power and mixes in all proportions with absolute alcohol, ether, hydrocarbons, and other organic liquids. It is an excellent solvent for many substances, such as sulphur, phosphorous, india rubber, gutta-percha, the resins, fats, etc. Water does not mix with it, and alcohol containing a considerable amount of water dissolves it only to a limited extent. The boiling point of carbon disulphide is 46° C. At high temperatures it dissociates into its constituents, carbon and sulphur. With the sulphides of the alkali metals in aqueous solution it forms compounds analogous to the carbonates and called thiocarbonates; the formula of potassium thiocarbonate is K_2CS_2 ; that of potassium carbonate being K_2CO_3 . The thiocarbonates are used for destroying vermin. Carbon disulphide is largely used as a solvent in preparing fats, extracting vegetable oils, etc. It may also be employed for the purpose of producing low temperatures: if evaporated rapidly, as by passing a current of dry air through it, its temperature is reduced as low as 60° below zero Centigrade. On account of its high refractive power, it is employed for scientific purposes in optics. Mixed with nitric oxide its vapors give a bright bluish-white flame which has been employed for photographic purposes.

CARBONEAR, kār'bō-nēr'. A port of entry on Conception Bay, Newfoundland, 25 miles northwest of St. John's (Map: Newfoundland, G 51. Pop., 1901, 3,703; 1912, 3,540).

CARBONIC-ACID GAS, CARBON DIOXIDE (carbon + dioxide, from Gk. *di-*, double + *oxide*), CHOKE DAMP, or FIXED AIR. A gaseous compound of carbon and oxygen represented by the formula CO_2 . It occurs in the free state as a constituent of atmospheric air, and in solution in sea water and mineral springs. It is largely evolved from fissures in the earth, especially in volcanic districts: in certain localities in Java and in the neighborhood of Lake Laach, near the Rhine, the amount of carbon dioxide evolved is so great that birds attempting to fly across the poisonous spots drop dead. The famous Dog Grotto, near Naples, is likewise filled to a certain height with carbonic-acid gas, by which dogs brought into the grotto are rendered insensible in a few seconds. The experiment is often performed, on payment of a small fee, for the amusement of tourists. The amount of carbonic acid normally contained in atmospheric air is relatively small—10,000 volumes of air contain about 3 volumes of carbon dioxide; or, which is the same, 10,000 parts by weight of air contain about 4.5 parts by weight of carbon dioxide. Animals constantly add to this by respiration; plants, on the contrary, absorb the gas, which they transform, with the aid of light, into oxidizable food matter. As a result, the amount of carbonic acid in the atmosphere tends to remain constant. However, the principal cause of the constancy of the composition of our atmosphere lies in the fact that the water of

the ocean contains immense quantities of free carbonic acid. If the amount of the latter in the air should rise above the normal, the excess would be dissolved in the sea; conversely, a certain amount of the gas would escape from the water if the amount in the air should fall below the normal. Slight variations, however, have been observed. Thus, in elevated places the amount of carbonic acid is usually smaller than near the level of the sea. In the vicinity of forests, too, especially in summer, the air contains somewhat less carbonic acid than the air in cities.

The average amount of carbonic acid produced in 24 hours by man is about 900 grams, the amount given out during the day being considerably greater than that produced during sleep. It has been recently suggested that the air in closed rooms may be continually purified and renewed by the use of sodium peroxide, a substance which has the property of absorbing carbonic acid and of giving off an equivalent amount of pure oxygen. The total amount of free carbonic acid in nature is obviously very great. But even larger quantities, probably, exist combined in the forms of carbonates, such as chalk and limestone, forming part of the solid crust of the earth. For experimental purposes carbon dioxide is most easily prepared by the action of dilute hydrochloric acid on chips of marble (calcium carbonate). The large quantities of carbonic acid employed in the arts are prepared in several different ways. Usually dilute sulphuric acid is made to act on some porous variety of calcium carbonate, such as chalk. In the manufacture of mineral waters, magnesite or the densest varieties of dolomite are employed, as they are liable to contain a smaller amount of organic matter than other materials. The carbonic acid used in sugar manufactories for precipitating lime is made by burning charcoal; the gas evolved from lime kilns, or that produced by fermentation, is largely used for the same purpose. Carbonic acid is also extensively used in the manufacture of soda. The gas employed in making artificial mineral waters (q.v.) must be carefully purified by passing it through solutions of potassium permanganate, which retains all organic impurities without attacking the gas itself. Carbonic acid does not support combustion; it is, therefore, used, highly compressed in iron cylinders, as a fire extinguisher. Besides the methods mentioned above, carbonic acid may be prepared by simply heating metallic carbonates; thus, in determining nitrogen, in organic analysis, the air is best expelled from the combustion tube by means of carbonic acid made by heating sodium bicarbonate or magnesium carbonate. Pure carbon dioxide is a colorless gas about one and a half times as heavy as air; it has a feeble odor and a slightly acid taste. Owing to its high density, it does not rapidly diffuse through air and may be poured like a liquid from one vessel into another. When absorbed by plants, its carbon is transformed into carbohydrates, while the whole of its oxygen is returned to the atmosphere. Taken into the stomach (say in the form of some mineral water), it has a refreshing effect and promotes digestion. If inhaled, however, it is supposed to decompose the hemoglobin of the blood and to enter into combination with the colored product of decomposition called hemochromogen. It has been shown, nevertheless, that the animal organ-

ism is capable of adapting itself in a peculiar way to the action of carbonic acid; birds confined within air-tight jars are capable of living in an atmosphere in which an animal introduced directly from fresh air would die in a very short time. The simplest way of testing the air in a room is to introduce a burning candle; if it continues to burn quietly and with a bright flame, the air is pure and respirable. The amount of carbonic acid in rooms should not exceed two grams to the cubic meter of air. Water containing free carbonic acid is capable of attacking many substances that pure water cannot dissolve. Many rock formations have been destroyed by the action of such water on the carbonate of lime contained in them. Under ordinary conditions of pressure and temperature, carbon dioxide dissolves in water in accordance with the law of Henry; i.e., the amount of gas absorbed is proportional to the pressure. This shows that carbonic acid proper, the compound of water and carbon dioxide ($\text{H}_2\text{O} + \text{CO}_2 = \text{H}_2\text{CO}_3$), forms in the solution in very small quantities only, most of the carbon dioxide being just physically dissolved, as would be nitrogen or any other inert gas. The salts of carbonic acid, the carbonates, are among the substances commonly met with in nature. At 0°C . carbon dioxide is liquefied under a pressure of 36 atmospheres. The critical temperature was ascertained by Andrews and, more recently, by Dewar. The latter investigator found that at 31.9°C . a pressure of 77 atmospheres is necessary and sufficient to liquefy it. Liquid carbon dioxide is now largely used in the arts. A mixture of liquid carbon dioxide and ether, if rapidly evaporated, attains a temperature of about 100°C . below the freezing point of water. Liquid carbon dioxide is used in Linde's refrigerating machine, and Pictet has obtained low temperatures by the use of a mixture of liquid carbon dioxide with sulphurous acid. The principal industrial uses of carbon dioxide in the gaseous state have already been noted above.

Chemically, carbonic acid is a dibasic acid capable of forming salts in which metallic elements are substituted either for one or for both of the hydrogen atoms. These salts, called *carbonates*, are readily decomposed by most other acids known in chemistry, carbonic acid being one of the weakest acids known. Even the so-called *acid carbonates* of sodium and potassium have a feebly alkaline reaction, for in aqueous solution they "hydrolyze" with the formation of free alkali, and it is this (and not the salt itself) that causes the alkaline reaction. Carbon dioxide is the earliest known gas. Paracelsus and Van Helmont, who lived in the sixteenth century, knew that the gas produced in burning charcoal was identical with that evolved by limestone heated to a high temperature. About the middle of the eighteenth century Joseph Black isolated it in a perfectly pure state. In the latter part of the eighteenth century Priestley discovered it in the air, and Lavoisier showed that the same gas was produced during the combustion and decay of vegetable and animal matter, during respiration, etc. Faraday was the first to liquefy it. See CHEMISTRY.

CARBONIC-ACID SNOW. This substance may be obtained by the rapid evaporation of liquid carbonic acid, which is allowed to escape from pressure into a towel or specially prepared perforated receptacle. Snow or crystals are formed at a temperature of -110°F . Applied

to warts or other excrescences on the skin, it produces shrinkage and destruction with little or no scarring. Care must be observed as to the length of application, since prolonged contact with human tissues will set up necrosis and ulceration.

CARBONIC OXIDE. See CARBON MONOXIDE.
CARBONIFEROUS LIMESTONE (Lat. *carbo*, coal + *ferre*, to bear), or MOUNTAIN LIMESTONE. A term used by Murchison, Lyell, and others to include much of the middle and lower portion of the Carboniferous system (q.v.), as now defined.

CARBONIFEROUS SYSTEM. One of the main divisions of the Paleozoic group of rocks, comprising all strata that lie between the Devonian and Permian systems. The name was first used in England, because of the coal seams contained in the strata, a characteristic now known to be of almost world-wide importance. The rocks of this system include a vast series of sandstones, shales, conglomerates, limestones, and beds of coal, which are of variable thickness and more or less interbedded. There is seldom any unconformity between the Carboniferous and underlying Devonian rocks in either Europe or America, and where isolated examples are known, as in parts of Nova Scotia, New Brunswick, Great Britain, and Bohemia, they indicate local disturbances. Coincident with this absence of any great stratigraphical break, there is also a gradual transition from the Devonian to the Carboniferous faunas. The rocks often show a basin-shaped arrangement, and in some areas, as in northeastern Pennsylvania, there is intense folding; but still there are thousands of square miles in China, western North America, and Russia which are underlain by nearly horizontal Carboniferous strata.

The different types of Carboniferous rocks mentioned above are divisible into two general groups, viz.: 1. Marine sediments, usually limestones, containing many invertebrate remains, such as corals, mollusks, encrinites, etc. The abundance of coral remains in some of them leads us to suppose that they represent fossil coral reefs. These Carboniferous limestones sometimes assume great thickness, as in Great Britain and western North America. 2. Shallow-water deposits, such as sandstones, conglomerates, or shales, deposited in shore waters or estuaries. These shallow estuaries or lagoons, by the formation of land across their mouth, often became converted into seacoast swamps in which there was a profuse growth of tall plants. These swamps were often of enormous extent, but at times the long-continued swamp growth became temporarily interrupted by the deposition of clay washed in either by flooded rivers or by the muddy waters of the sea breaking in. Or, again, the sinking of the area below the ocean level may have caused the accumulation of much sediment over the swamp growth. Subsequently the plant accumulation became changed to coal, and the clay to shale. We find records of these changes at the present day in the alternating coal and shale seams.

Carboniferous rocks are widely distributed over the globe, underlying wide areas in North America, South America, Europe, China, Africa, and Australia. In classifying the rocks of these areas, the divisions of the first order are the same, but the smaller divisions are commonly local ones. The first order division consists in grouping the Carboniferous into:

1. Lower Carboniferous, or Mississippian.

2. Upper Carboniferous, or Pennsylvanian.

The Permian is considered by some American geologists as a part of the Carboniferous, since the strata of that system follow upon the latter without a break, so far as they are exposed in this country, and the division between the two systems must be drawn from evidences afforded by fossils; but recent opinion favors their separation into independent members of the Paleozoic group. In the United States the Carboniferous sections along the Appalachians and in the Mississippi valley are divided as follows: Pennsylvania—Lower Carboniferous, (1) Pocono sandstone; (2) Mauch Chunk sandstone and shale: Upper Carboniferous, (1) Pottsville Conglomerate or Millstone Grit; (2) Lower productive measures, including coal, shale, and sandstones; (3) Lower barren measures, including sandstones and shales; (4) Upper productive measures, including coal, shale, and sandstones. Mississippi valley—Lower Carboniferous, (1) Kinderhook; (2) Osage, including (a) Burlington; (b) Keokuk; (c) Warsaw; (3) St. Louis group; (4) Chester or Kaskaskia group: Upper Carboniferous, (1) Millstone Grit; (2) Coal measures.

In the United States the Carboniferous is found underlying a number of areas. In Rhode Island there is a small one of highly metamorphosed rocks, in which the coal beds have been nearly changed to anthracite. A large area extends from Pennsylvania southward to Alabama and westward to Missouri and Arkansas and Texas. Along the Appalachians the prevailing rocks of this area are sandstones and shales, which contain many coal seams and are much folded; but westward the folds die out and limestones begin to predominate. Workable beds of coal are found in all the States of this area. In the Mississippi valley the crinoidal limestones are important members. The Carboniferous section shows a variable thickness, having a maximum of nearly 8000 feet in Pennsylvania and only 1200 to 1500 in Illinois; but the beds thicken again in the States west of the Rocky Mountains—in Utah, Nevada, and Arizona—where they are represented mainly by limestones and sandstones which contain no coal. Near Pottsville, Pa., there are 25 coal beds, whose aggregate thickness is 154 feet. In Alabama there are 17 in one field. In the Western interior region, especially near the summits of the Rocky Mountains, the Carboniferous strata consist mostly of marine limestones, with no coal. There are also scattered areas in the Black Hills and along the Pacific coast and in the Arctic region. The coal beds are usually underlain by clay beds, representing the ancient soils, in which are sometimes found the upright roots and trunks of trees that grew in the Carboniferous swamp.

In Europe the coal measures of England are 3000 to 5000 feet thick, increasing even to 12,000 feet in South Wales. Carboniferous rocks also occur in Germany, France, Belgium, Austria, and Russia. In China they extend over many thousand square miles as vast table-lands and contain perhaps the richest coal deposits of the world. In the Province of Shansi alone they cover an area of about 15,000 square miles and include seams of anthracite 30 feet or more thick. They are also extensively developed in India and in Australia and Africa.

Both animal and vegetable remains are abun-

dant in the Carboniferous, and are in many cases well preserved. The abundance of the latter is easily understood when we remember that coal has been formed by the accumulation of vegetable matter, and we consequently find the plant fossils in the coal itself as well as the inclosing beds. There is a great uniformity of character in the plant life, the same genera and often the same species occurring in widely separated regions. About 2000 species are known which, with the exception of a few plants of doubtful relationship, may be referred to the following families: Equisetaceae, lycopods, conifers, and ferns. Of the Equisetaceae the most abundant genus was *Calamites* (q.v.), which included several species of large, tapering, reedlike plants that apparently flourished on the borders of the coal swamps. The lycopods were represented by the *Sigillaria* (q.v.) and the *Lepidodendron* (q.v.), closely related genera that are believed to have furnished a large part of the material for the formation of coal. The *Sigillaria* had gently tapering, fluted stems, which grew to a height of 50 feet or more and had a diameter of 5 feet. The bases of the trunks, with their radiating roots, are often found in the clay that underlies the coal seams, and for a long time they were supposed to be a distinct species. (See STIGMARIA.) The *Lepidodendron* bore a great resemblance in structure and appearance to the club moss of the present day, but it attained gigantic proportions. Conifers were probably abundant in Carboniferous times; they differed widely, however, from existing conifers, and bore nutlike fruits, which have been frequently preserved. (See TRIGONOCARPUS.) The genus *Cordaites*, which appears to have been very abundant, is classed by some botanists with the conifers; by others, with the cycads. The fern family was represented by a large variety of species, some of which were tree ferns. The most common forms were *Sphenopteris*, *Cyclopteris*, *Neuropteris*, *Odontopteris*, and *Pecopteris*. The animal remains of the Carboniferous system are both numerous and well preserved, but they are found in greatest abundance in the Lower Carboniferous limestones. Corals and crinoids are numerous, both as regards individuals and species, and in places constitute great thicknesses of rock. More than 650 species of crinoids have been described from the Lower Carboniferous of America alone. Among the brachiopods, *Productus*, *Spirifer*, and *Chonetes* are most numerous, while mollusks are represented by cephalopods, gastropods, and lamellibranchs, some species of which pass out of existence at the close of the period. Trilobites are present, but not in such variety as in the earlier Paleozoic times, and they diminish rapidly towards the end. Crustaceans are abundant, especially *Beyrichia* and *Estheria*, and they show a rapid development. Insects appear to have flourished in great numbers; the known varieties include spiders, scorpions, dragon flies, grasshoppers, and cockroaches. Among fishes, the ganoids and selachians are represented. The ganoids, having their entire surface covered with scales, were numerous; some of them inhabited shallow water near the shore and fed on crustaceans and shellfish, for crushing which they had a formidable apparatus of conical teeth of a very complicated structure. Others were inhabitants of deep water and were more powerful and predacious and more rapid in their movements. Their jaws were produced into a long snout, like the croco-

dile of the Ganges, and armed with a double series of enormous teeth, which were sometimes as much as 4 inches long by 2 inches broad, as in *Megalichthys* (q.v.), dimensions rarely attained even by the largest known reptiles. Associated with these were a great number of sharks belonging to the Cestracodontidae, a family of which we have only a single living representative. (See CESTRACIONT.) They had a long, bony spine, to strengthen the dorsal fin, and this enabled them to turn speedily in the water, as they required to do in seizing their prey. These spines are often found fossil. The only remains referred to a higher division of the animal kingdom yet found belong to the saurian *Stegocephalia* (q.v.). The Carboniferous also contains the first traces of amphibians. Of these, only footprints are found in the Lower Carboniferous, but in the coal measures the actual bones are met with.

The alternation of rocks of different character shows that oscillations of the land surface must have been extensive and long continued, though not violent. Thus the great beds of coal indicate a period of inland shallow water in which swampy conditions existed. These must have continued for a long period, for the coal beds are often very thick, and it has been calculated that an eighth of an inch of coal means at least one inch of plant accumulation. That these swamp areas became at times submerged to some depth, due to the sinking of the land, is indicated by the presence of marine limestone beds over them. The climate that predominated during the Carboniferous was one of warmth and moisture, with the percentage of carbon dioxide in the atmosphere somewhat greater than it is now, but not necessarily excessive.

The great importance of the economic minerals in the Carboniferous has had much to do with our extensive knowledge of it. The productive coal fields cover an area of many hundred thousands of square miles. (See COAL.) In addition to the coal deposits, many other useful minerals are found in the Carboniferous of the United States. The clay beds associated with the coal seams afford valuable supplies of fire clays, pottery clays, and brick clays; iron ores are found in Pennsylvania, Kentucky, and Ohio. Building stones are quarried in the Carboniferous of many States, the sandstones of Berea, Ohio, being specially important. The Lower Carboniferous strata furnish salt in Ohio, Michigan, and West Virginia, oil and gas in West Virginia, and zinc ore in Missouri, Kansas, and Arkansas. The rich deposits of copper ores in Arizona occur partly in Carboniferous limestones.

Consult: Dana, *Manual of Geology* (New York, 1895); Geikie, *Text-Book of Geology* (London, 1903); Chamberlin and Salisbury, *Geology*, vol. ii (New York, 1907); *United States Geological Survey Bulletin* No. 80 (Washington, 1891). See COAL; GEOLOGY; CLAY; IRON.

CARBONITE. See EXPLOSIVES.

CARBON MONOXIDE, or CARBONIC OXIDE, CO. A gaseous compound of carbon and oxygen. It does not occur naturally, but may be observed burning with a pale-blue flame in fireplaces and stoves. During the combustion of lower layers of the fuel the oxygen of the air unites with the carbon of the fuel to form carbonic-acid gas, CO₂; and this gas, rising through red-hot coal, has part of its oxygen abstracted by the latter, and, as a result, carbon monoxide is produced, which, taking fire on the top of the coals, burns,

abstracting more oxygen from the air and reforming carbonic-acid gas, CO₂.

Carbonic oxide may be prepared by heating either potassium ferrocyanide or oxalic acid with strong sulphuric acid. It is a colorless gas somewhat lighter than air, in which it burns with a characteristic bluish flame. It is *exceedingly poisonous*, forming a chemical compound with the hæmoglobin of the blood, and thus preventing the latter from carrying the oxygen which is necessary for supporting the processes of life. The symptoms of carbon monoxide poisoning are headache, dizziness, and nausea, which, if the inhalation of the gas is continued, terminate in death. Hence the great danger arising from checking the escape of the products of combustion in stoves and furnaces, or of allowing illuminating gas to escape into rooms; for ordinary coal gas contains about 8 per cent, water gas about 40 per cent, of carbonic oxide. Carbonic oxide in the air may be detected by a solution of palladium chloride, which used to moisten a cloth will develop a brown coloration when exposed to air containing traces of this gas. Carbonic oxide is one of the few compounds of carbon where that element occurs in a bivalent state. In most compounds carbon is quadrivalent. See VALENCY.

CARBON PAPER. See COPYING MACHINES AND PROCESSES.

CARBONS, ELECTRIC LIGHT. See ELECTRIC LIGHTING.

CARBONYL CHLORIDE. See PHOSGENE GAS.

CARBORUNDUM. See ABRASIVES.

CARBOY (Pers. *qarābah*, a sort of bottle). A large glass bottle, cased in wicker, or protected by a wooden box, used to contain acids or other corrosive liquids, such as sulphuric acid (oil of vitriol). A carboy for sulphuric acid usually has a capacity of 12 gallons and contains about 180 pounds of that acid.

CARBUNCLE (OF., from Lat. *carbunculus*, gem, from *carbo*, coal). A name applied to the scarlet and crimson varieties of garnet when cut with a convex face (*en cabochon*). The ancients applied the name indiscriminately to all red and fiery stones, as *spinel* and *Oriental ruby*. Carbuncles were highly prized for their supposed mysterious power of giving out light in darkness. According to the Talmud, the only light that Noah had in the ark was furnished by carbuncles and other precious stones. The famous necklace of Mary Queen of Scots had a lustrous carbuncle as a pendant. See GARNET; GEMS.

CARBUNCLE (Lat. *carbunculus*, a little coal). An acute inflammation of the cellular or connective tissue beneath the skin, that may occur on any part of the body, but is more frequent on dorsal surfaces, especially on the back of the neck and shoulders. It derives its name from the two most prominent symptoms—redness and burning pain. It quite closely resembles, especially in its early stages, the common furuncle, or boil, but the symptoms, both local and general, are much more severe. The development of the carbuncle is accompanied by constitutional disturbances, such as chills, fever, aching, and general malaise. The severity of the inflammation varies, and is regularly accompanied by death of a portion of the tissue. The first local manifestation consists in slight swelling and redness. The part feels hard, and this hardness extends deeply into the tissues. As the local lesion advances, the redness as-

sumes a dark purple or livid hue, and several small blisters appear on the surface. These open and discharge a thin, viscid fluid, rarely pus. At the centre of the carbuncle the tissue usually dies and becomes gangrenous. This central area is generally quite extensive and consists of an infiltration of a mass of tissue, all of which sloughs away in time and leaves a scar when healing is complete. The entire area of the carbuncle usually becomes fixed quite early in its development, and the carbuncle limits itself to that area. The treatment of carbuncle is both surgical and medical, the former consisting in free incisions, packing with gauze, and antiseptic dressings; the latter, in general, tonic and supportive treatment. See ANTHRAX.

CARBURETOR. See MOTOR VEHICLE.

CARCAGENTE, or **CARCAJENTE**, *kār'-kā-hān'tā*. A town of Valencia, Spain, situated about 25 miles south of the city of Valencia, and near the right bank of the Júcar (Map: Spain, E 3). It is well built, with good streets, and has a palace belonging to the Marquis of Calzada. It produces linen, silk, and wool, and especially rice. Pop., 1900, 12,351; 1910, 13,520.

CARCAJOU, *kār'kā-jōū* (Fr. form of the American-Indian name). A Canadian name for the wolverine, sometimes improperly applied, especially by the older writers, to the panther.

CAR/CANET (LL. *carc[h]annum*, a collar of jewels, OHG. *querca*, throat). A jeweled chain or necklace. Venice was famous for the manufacture of carcanets in the fifteenth century.

CARCANO, *kār-kā'nō*, GIULIO (1812-84). An Italian author, born in Milan. He was appointed professor at the Academy of Fine Arts in Milan in 1859 and became a senator in 1876. His publications include tragedies, which met with little success; translations of Shakespeare's plays; volumes of poetry; and romances (for these he is chiefly celebrated) which are distinguished by their charming pictures of family life in Lombardy, and of which the best is *Angiola Maria* (1839). A complete edition of his works (Milan, 1892) appeared after his death. Consult Rizzi's preface in *Lettere di Giulio Carcano* (Milan, 1887).

CARCAR, *kār'kār*. A city of Cebu, Philippines, 23 miles southwest of Cebu, the capital of the province (Map: Philippine Islands, D 5). It is situated on the east coast of the island, near the Bay of Carcar. The city was founded in 1624. Pop., 1903, 31,895.

CAR/CASSO. See CARCASSONNE.

CARCASS (OF. *carcois*, quiver, from ML. *carcassium*, a corruption of *tarcasius*, from Pers. *tarkash*, quiver, by association with ML. *carcassium*, carcass). An incendiary shell filled with a fiercely burning composition consisting of saltpetre, sulphur, resin, turpentine, antimony, and tallow, and generally designed to be fired from a mortar. It had usually three large vents, through which the flame escaped. In some carcasses the vents were fitted with short barrels loaded with balls, so arranged as to discharge their contents at the time desired. It is now seldom used.

CARCASSONNE, *kār'kā'sōn'* (Lat. *Carcaso*). The capital of the Department of Aude (Languedoc), France, and see of a bishop, on the river Aude and the Canal du Midi, about 55 miles southeast of Toulouse (Map: France, S. G 5). It is divided into two parts—the old and new towns. The modern town is well built, although the old town, built on a height, and a picture of

decay, is much more picturesque, with its double line of walls and towers, some parts of them dating from the time of the Visigoths, and the rest from the eleventh or twelfth century. Principal buildings are the restored cathedral of Saint-Nazaire (eleventh century), the courthouse, the prefecture, the old market, and the cathedral of St. Michel and church of St. Vincent. The town contains a lyceum, a teachers' college, a seminary, a public library, and a museum. The cloth manufactures employ a large number of operatives. Carcassonne also manufactures paper, leather, linen, soap, ironware, and pottery, and has considerable trade in wine, brandy, and dried fruit. The whole department is represented at its November fair. Population of commune, 1901, 30,720; 1911, 30,689. The ancient city, Carcaso, in the Province of Gallia Narbonensis, fell into the hands of the Visigoths about 725; it was ruled by viscounts from the eleventh to the thirteenth century, and was united to France in 1209. In 1247 King Louis, the Saint, founded the lower town. It was pillaged and burned by the Black Prince in 1355, and in 1566 a Huguenot massacre took place within its walls. Consult: Viollet-le-Duc, *Carcassonne* (Paris, 1858); Peixotto, "Carcassonne," in *Scribner's Magazine*, vol. xxix (New York, 1901); L. Fedie, *History of Carcassonne* (Carcassonne, 1888).

CAR/CEL UNIT. A French lamp burning colza oil with a wick constructed according to certain specifications and used as a photometric standard unit. One Carcel unit is equal to 9.615 International candles, a standard which, in April, 1909, was adopted and defined as a common unit by the National Physical Laboratory of London, the Laboratoire Central d'Electricité, Paris, and the United States Bureau of Standards, Washington. See PHOTOMETRY.

CAR/CER, or **CARCER TUL/LIA/NUM**. See MAMERTINE PRISON.

CARCHEMISH, *kār'kē-mish* or *kār-kē'mish* (Heb. *Karkemish*, Bab. *Karkamishu*, Ass. *Kargamis*, or *Gargamis*, Eg. *Karakamisha*). An important Hittite city in northern Syria. It was situated on the western bank of the Euphrates. While the exact site has not been ascertained beyond all doubt, there is a practical unanimity of opinion among scholars to-day as to its probable location. Circesium, or Carcesium (Ammianus, xxiii, 5), at the mouth of the Chaboras, the modern Al Buzera, supposed by Bochart, Rosenmueller, Ewald, Hitzig, and Reuss to be identical with Carchemish, is too far south; Birejik (Bir, Apamea), suggested by Hincks, is too far north; Membij (Mabog, Bambuke, Hierapolis), favored by Rawlinson, Finzi, Maspero, and Wilson, is too far from the Euphrates; Kal'at Nijm, proposed by Nöldeke, does not seem to have any pre-Islamic ruins; but since George Smith in 1876 visited Jerablus and Jerabis and identified the former with Carchemish, Sayce, Schrader, Delitzsch, and all recent investigators have adopted this view. Maundrell, Skene, and Smith heard the name pronounced "Jerablus," and Benzinger in 1912 called the great mound of Carchemish "Jerablus Kal'a." On the other hand, the maps of Sachau and Oppenheim give two places with the name Jerabis, but no Jerablus, and Sachau declares that he never heard from the natives the latter name. Jerabis is the plural of Jirbas, representing *Ἰέρβας*, *Eurōpos*; after Mabog-Membij had taken the place of Hierapolis, this name may, on account

of the similarity, have been occasionally used of one of the two Jerabis. The earliest-known references to Carchemish are found in *Cuneiform Texts in the British Museum*, ii, Bu. 88-5-12, 163. 11 and 88-5-12, 19, 8. They come from the beginning of the twentieth century B.C., before the reign of Ammizaduka (1777-57) and apparently mention measures or weights of Karkamishu, showing that the city was already at that time a centre of trade. Five centuries later Thotmes III (1501-1447) met the people of Carchemish in battle, and Amenemhebe mentions that he took some of them as prisoners. Tiglath-pileser I (c.1140-05) defeated the inhabitants but did not take the city. Asurnazirpal III (885-860) received tribute from Sangara, King of the Hittites, who apparently reigned in Carchemish, and so did Shalmaneser III (860-825), whose artists represented the famous fortress on the bronze walls of Balawat. Sargon II (722-705) finally conquered the city in 717, took its last king, Pisiris, prisoner, deported its people, and settled Assyrians in it. An Assyrian governor, Belimurani, is mentioned in the year 692 as *limmu*. According to the Hebrew text in 2 Chron. xxxv. 20, Neco went up to fight "against Carchemish," but the Greek version reads "against the king of Assyria," and 2 Kings xxiii. 29 does not mention Carchemish; Josiah died at Megiddo in 608. In an editorial superscription to two oracles against Egypt preserved in Jer. xli the army of Neco is said to have been defeated at Carchemish by King Nebuchadrezzar in the fourth year of Jehoiakim (605 B.C.). It is thought by many scholars that, in spite of its late date and the silence of the cuneiform inscriptions, Berossus, and the Greek historians, this editorial note has alone preserved the memory of one of the important battles of the world. The *maneh* of Carchemish was the most common unit of money in Assyria. On the site of Carchemish, or near it, the city of Europolis seems to have flourished in Hellenistic times. As to the meaning of the name "Carchemish" nothing is known with certainty. Hoffmann suggested Kerak Mish, or 'Castle of Mish'; Johns, Kar Gamis, or 'Fortress of (the god) Gamis'; Sarsowsky, Kar(Gil)gamish, 'Stronghold of (the god) Gilgamesh.' Against understanding it as the 'Stronghold of Chemosh' Sarsowsky urges the early appearance of the name and the Assyrian spelling Kamush for Chemosh. But the worship of this god may once have extended far beyond the limits of Moab, and the variations Kamish, Kamush, and Kamosh are not more strange than Asir, Asur, Yaho, Yahwe, and many other differences in the pronunciation of the same divine name. The excavations carried on by Henderson in 1878-79, and especially those by Hogarth in 1911, have brought to light many Hittite monuments and inscriptions. Consult: G. Rawlinson, *The Five Great Monarchies*, 2d ed., vol. ii, p. 67; Finzi, *Ricerche per lo studio dell' antichità Assira*, pp. 257 ff. (1872); Maspero, *De Carchemis Opidi Situ et Historia Antiquissima* (1873); Schrader, *Keilschriften und Geschichtsforschung*, pp. 221 ff. (1878); Delitzsch, *Wo lag das Paradies?* pp. 265 ff. (1881), contains also extracts from the notebooks of George Smith; G. Hoffmann, *Auszüge aus syrischen Acten persischer Märtyrer*, p. 163 (1880); Sachau, *Reise in Syrien und Mesopotamien*, pp. 168 f. (1883); W. Max Müller, *Asien und Europa*, p. 263 (1893); Johns, in *Proceedings of the Society*

of *Biblical Archaeology*, p. 141 (1899); Sarsowsky, in *Zeitschrift für Assyriologie*, pp. 377 (1911); Benzinger, in *Baedeker's Palestine and Syria* (1912).

CAR'CINO'MA. See TUMOR.

CAR'DAMINE. See CRESS.

CAR'DAMOM, or CAR'DAMON (Fr. *cardamome*, Lat. *cardamomum*, Gk. *καρδάμωμον*, *kardamōmon*, from Gk. *κάρδαμον*, *kardamon*, a cress + *ἄμωμον*, *amōmon*, a spice plant). The capsule of certain species of plants of the family Zingiberaceæ, and belonging to at least two genera—*Amomum* and *Elettaria*. Cardamoms are three-celled and contain numerous wrinkled seeds, which form an aromatic, pungent spice, weaker than pepper and with a peculiar but agreeable taste. On account of their cordial and stimulant properties, they are employed in medicine very generally, to qualify other medicines. They are also used in confectionery, although not to a great extent. In Asia they are a favorite condiment, and in the north of Germany they are used in almost every household to flavor pastry. The cardamom recognized in the British and American pharmacopœias and called true or official cardamom—also known in commerce as Malabar cardamom—is the product of *Elettaria cardamomum*, a native of the mountains of Malabar, and is cultivated in India, Ceylon, etc. The seeds depend for their qualities on a peculiar, pungent, essential oil, called oil of cardamom, which may be obtained from them by distilling with water, and which, when fresh, is colorless. They also contain 10 per cent fixed oil. Other kinds of cardamom occur in commerce, but none is equal to the true cardamom in commercial value. The different kinds of cardamom differ not only in strength, but in the character of their aroma, though the plants producing them have much general similarity. See Plate of CARNATIONS, ETC.

CARDAN, JEROME, often referred to as HIERONYMUS CARDANUS or GIROLAMO CARDANO (1501-76). An Italian mathematician, born at Pavia, the illegitimate son of Facio Cardan, a jurist. He was at once an astrologer and a genuine philosopher; a gambler and charlatan, and a true devotee of science. As early as 1523 Cardan taught mathematics at Pavia. In 1524 he took the degree of doctor of medicine at Padua and spent the following seven years practicing medicine at Sacco. Here Cardan met his wife and is said to have squandered her fortune in gambling. In 1534 he was appointed to the chair of mathematics at Milan, and while holding this post, and at the same time practicing and teaching medicine, he produced his principal works, which are noticed below.

In 1552 he started on an extensive journey through central and northern Europe, and in 1559 obtained the chair of medicine at Pavia and later at Bologna, remaining there from 1562 until 1570. While living in Bologna he was imprisoned for debt, or on the charge of heresy for having published the horoscope of Christ, and on his release resigned his professorship at the university. He then went to Rome and was admitted by Pope Gregory XIII to the College of Physicians and allowed a pension. He died in Rome in 1576.

The *Ars Magna* (1545), by far the greatest work of Cardan, contains the celebrated solution of the cubic equation. The solution had been discovered in 1541 by Tartaglia, who communicated it to Cardan under the most solemn

vows of secrecy. Cardan, nevertheless, published the solution under his own name, and hence arose a dispute over the authorship of the discovery. After 10 years of controversy, challenge, and counterchallenge, Tartaglia began publishing his own work (1556), but died before reaching the chapter on the cubic equation. Thus the greatest mathematical discovery of the sixteenth century came to be known as Cardan's method. The solution, as given by Cardan in geometrical terms, is, briefly, as follows: To solve the equation $x^3 + 6x = 20$, take two cubes such that the rectangle of their respective edges is 2 and the difference of their volumes is 20; then x is equal to the difference between the edges of the cubes. In the general equation $x^3 + px = q$, the rectangle of the edges is a third of p , and the difference of the volumes of the cubes is q . The publication of the *Ars Magna* stimulated mathematical research and hastened the general solution of biquadratic equations, of which Cardan himself had solved special cases, as $13x^2 = x^4 + 2x^2 + 2x + 1$; although the credit of producing the first general solution belongs to his pupil Ferrari. Cardan recognized negative roots, which he designated as fictitious; he also observed that imaginary roots occur in pairs, but discarded them as impossible, and failed to understand the irreducible case of the cubic. He found the relation of the roots to the coefficients of an equation, recognized that the change of sign of a function implies a root, and gave a method of approximating the roots of numerical equations. His discussions of quadratic equations were important.

Bibliography. Besides the *Ars Magna*, his most important works include: *Practica Arithmetica Universalis* (1539); *De Subtilitate Rerum* (1551), and its sequel, *De Varietate Rerum*. *Artis Magnae sive de Regulis Algebraicis, lib. unus* (1545); *De Vita Propria* and *De Libris Propriis* (1571-75); *Encomium Geometriae* (1535); *De Regula Alica, Exercetion Mathematicorum, Sermo de Plus et Minus* (1540-50). The standard collection of Cardan's works is that of Sponius (Lyons, 1663). Consult: Morley, *Jerome Cardan* (London, 1854); Rixner and Siber, *Leben und Lehrmeinungen berühmter Physiker am Ende des XVI. und am Anfange des XVII. Jahrhunderts* (Sulzbach, 1820); Firmiani, *Giro-lamo Cardano, la vita e l'opere* (Naples, 1904).

CARDBOARD. A material prepared by pasting together several layers of paper, according to the thickness and quality required. *Bristol board*, used by artists, is made entirely of white paper; ordinary cardboard, of fine white paper outside, with one or more sheets of coarse cartridge paper between. According to the number of layers, they are called *three*, *four*, *six*, or *eight sheet boards*. *Millboard*, used by bookbinders as the basis of book covers, is made of coarse brown paper, glued and strongly pressed.

The enameling of visiting cards and fine cardboard is produced by brushing over the cardboard a mixture of *China* or *Kremnitz white* (a fine variety of white lead) and size. After drying, this surface is rubbed lightly over with a piece of flannel, previously dipped in finely powdered talc; it is then polished by rubbing vigorously with a hard, close-set brush.

CARDEN, SIR LIONEL EDWARD GRESLEY (1851-1915). An English diplomat, educated at Eton College. He was appointed Vice Consul at Havana in 1877, was sent with Sir

S. St. John's special mission to Mexico in 1883, was made Consul in the city of Mexico in 1885, and for the next four years served as British Commissioner on the Mexican Mixed Claims Commission. He returned to Cuba to serve as Consul General in 1898-1902, and as Minister to Havana in 1902-05. In 1911 he was appointed Envoy Extraordinary and Minister Plenipotentiary in Central America, and in 1913 he was sent to Mexico as British Minister. The fact that the new Minister presented his credentials to General Huerta on his arrival in Mexico City was interpreted as recognition of the Huerta régime by the British government, and Sir Lionel Carden's attitude throughout the Mexican troubles was at times represented as strongly anti-American. See *MEXICO, History*. Sir Lionel Carden was created K.C.M.G. in 1912.

CARDENAL, kār'de-nāl', or **CARDINAL**, PIERRE or PEIRE (c.1205-c.1305). A French troubadour, born at Puy-en-Velay. He lived to be nearly 100 years old and found especial favor with James I of Aragon. His poems are mostly sirventes, satirizing the clergy and nobles of his day. About 70 are published in Mahn's *Gedichte der Troubadours* (4 vols., Berlin, 1856-73). Consult Fauriel, *Histoire de la littérature provençale* (3 vols., Paris, 1846), and Diez, *Leben und Werke der Troubadours* (Leipzig, 1882).

CÁRDENAS, kār'dá-nās. A seaport of Cuba, in the Province of Matanzas, situated on the north coast, about 80 miles east of Havana, with which it is connected by rail (Map: Cuba, D 3). Its harbor is wide but shallow. It is regularly built with wide streets and broad plazas, in one of which is a statue of Columbus. Cárdenas is one of the important commercial centres of the island, its chief exports being sugar and tobacco, largely by American firms. Asphalt has been taken from the bed of the harbor. On May 11, 1898, Cárdenas Bay was the scene of an engagement between the blockading vessels of the United States fleet and the Spanish batteries, in which Ensign Worth Bagley was killed, he being the first American officer to lose his life in the war. Pop., 1907, 24,280; of municipal district, 1907, 28,576.

CÁRDENAS, kār'dá-nās, GARCÍA LÓPEZ DE. A Spanish adventurer, captain in the army of Vasquez Coronado (q.v.), in 1540, during the exploration of New Mexico and Arizona. In September, 1540, he led the first European expedition to the Grand Cañon of the Colorado. Consult H. H. Bancroft, *Works*, vols. xv-xvii (San Francisco, 1884-89).

CARDEÑO, HISTORY OF. A play once ascribed to Fletcher and Shakespeare, on the authority of Moseley in the *Stationers' Register*. The date of the entry is Sept. 9, 1653. It has been thought to be identical with a lost play entitled *Cardenia*, or *Cardano*, acted in 1613, which Fleay also identifies with Fletcher's *Love's Pilgrimage*. Its history is purely conjectural, but later authorities are unanimous in questioning Shakespeare's collaboration in it.

CARDIA (Neo-Lat., from Gk. *kardia*, *kardia*, heart). The orifice of the stomach which admits the œsophagus was called, on account of its vicinity to the heart, by the same Greek name, *cardia*, and was probably hardly distinguished from the heart in the earliest times of Greek medicine.

CARDIALGIA (Neo-Lat., from Gk. *kardia*,

kardia, heart + *algos*, *algos*, pain). Pain of the heart or stomach. The name is commonly but loosely applied to pain occurring over the cardiac and epigastric regions, due to indigestion accompanied by *heartburn*, acid eructations and the presence of gas. The heart is not affected. See INDIGESTION.

CARDIFF (*Caer-Taff*, Fort of the Taff). A parliamentary and municipal borough, and capital of Glamorganshire, and the largest port of Wales, situated on the river Taff, near its mouth in the estuary of the Severn, 170 miles west of London by railway (Map: Wales, C 5). Its most notable building is the castle, built in the eleventh century, in which Robert Curthose, Duke of Normandy, died, after captivity in various fortresses during 28 years. It has been carefully restored and is occasionally used as a residence by its owner, the Marquis of Bute, to whose family Cardiff owes much of its prosperity. Other edifices of interest are the church of St. John, dating from the thirteenth century, with a fine Perpendicular tower, and the free library, erected in 1882, which contains a museum and art gallery.

Although the construction of the Glamorgan-shire Canal in 1794 may be taken as having marked the first step in the development of the town from an insignificant village to one of the most important ports of the United Kingdom, it was not until after the opening of the first great dock, in 1839, that its possibilities as an outlet for the mineral wealth of the surrounding region were fully realized. The docks and basins are five in number and cover an area of more than 160 acres and 7 miles of quays. In the same series of harbor works are included the Penarth docks, embracing 26 acres at the mouth of the river and 114 acres at Barry, 8 miles to the southwest. They are owned by Lord Bute, but the town derives a considerable annual revenue from harbor dues. The municipal authorities have kept pace with the rapid growth of the town by obtaining an excellent water supply, by introducing electric lighting, establishing public baths and a gymnasium, markets, slaughterhouses, a sewage farm, and a cemetery. In Cardiff is the University College of South Wales and Monmouthshire, wherewith is affiliated the woman's college of Aberdare Hall; technical schools and a higher grade school, and a central free library, with six branches, are all maintained by the corporation; a treasury grant supports a national museum of Welsh antiquities. The importance of the town lies in its commerce, especially in its coal and iron trade, although there are also shipbuilding yards, iron, steel, and tin plants. The export of coal to foreign countries increased from 1,451,000 tons in 1865 to 10,115,000 in 1891. In 1898 there was a temporary decline, on account of the great coal strike, the total export of coal and coke amounting to only 9,109,515 tons, but it has since risen again, and amounted in 1913 to 26,340,012 tons. The total tonnage entered in 1912 was 6,236,944; the clearances, 9,168,115. In clearances Cardiff was the first port of the United Kingdom, London coming second with 40,000 tons less; in entries it ranked fourth after London, Liverpool, and Newcastle. In 1913 the coal export was valued at about \$116,159,000. Besides coal, the chief exports are iron and steel manufactures, machinery and mill work, railway cars and wagons, sacks, etc. The imports comprise cattle, grain, copper, and iron

ores, petroleum, timber, and market produce. The total value of imports and exports during 1911 was \$91,003,026, and in 1906, \$71,174,654. The United States is represented by a consul. Cardiff is adequately provided with railway facilities, being connected by the Taff Vale and Rhymney lines with the mineral fields of South Wales, and by the Great Western with London. Pop., 1800, about 2000; 1850, 18,000; 1871, 56,911; 1881, 85,378; 1891, 128,915; 1901, 164,333; 1911, 184,663.

The town probably existed during the Roman occupation. It was a place of importance under the Normans. During the Civil War the castle was alternately in the hands of the Royalists and the Parliamentarians. In 1648 Cromwell captured it after a bombardment lasting three days.

Consult Stuart, "History of Cardiff" in *Archæological Journal*, vol. xxviii (London, 1871), and "Architecture of Cardiff," in *Builder* (ib., March, 1897).

CARDIFF, IBA D. (1873—). An American botanist, born in Stark Co., Ill. He was educated at Knox College, at the University of Chicago, and at Columbia University. In 1906-07 he was assistant professor of botany, and in 1907-08 professor, at the University of Utah. He became professor of botany at Washburn College, Topeka, Kans., in 1908, and director of the Washburn Summer School in 1909. In 1911 he was professor of botany in the University of Kansas Summer School. His writings consist of contributions to the *Botanical Gazette*, *Bulletin of the Torrey Botanical Club*, and *Plant World*.

CARDIFF GIANT. A rude statue of a man 10½ feet high, cut (in Chicago) from a block of gypsum quarried from the great beds of that mineral near Fort Dodge, Iowa, in 1868, and buried near Cardiff, Onondaga Co., N. Y., where it was "discovered" late in the following year and for some time exhibited as a "petrified giant." The hoax, subsequently exposed by Prof. O. C. Marsh, of Yale, was perpetrated by George Hall, of Binghamton, N. Y., his purpose being to ridicule the belief in "giants" professed by some religious folk, on the strength of the mention of such creatures in Genesis vi. 4,—"There were giants in the earth in those days." Consult "The Cardiff Giant: The True Story of a Remarkable Deception," by Dr. Andrew D. White, in the *Century Magazine*, vol. xliii (1902).

CARDIGAN (anciently, *Aberteifi*, Mouth of the Teifi). The capital of Cardiganshire, Wales, a municipal borough and seaport, on the right bank of the Teifi, about 3 miles from its mouth and about 75 miles west-northwest of Cardiff (Map: Wales, B 4). The town has a considerable coasting trade, largely in produce and slate. It owns its water works and maintains markets and a cemetery. Pop., 1901, 3500; 1911, 3578. Cardigan became an important town about the time of the Norman Conquest. There are the remains of a castle supposed to have been built about the year 1091 by Roger de Montgomery, a Norman baron. The town suffered much in the struggles between the Welsh and the English.

CARDIGAN, JAMES THOMAS BRUDENELL, seventh EARL OF (1797-1868). An English general. He was educated at Christ Church, Oxford, and became a member of Parliament in 1818. In 1824 he entered the army, and by 1832 had risen, through lavish expenditure in pur-

chasing his grades, to the rank of lieutenant colonel. As an officer he was overbearing and quarrelsome. In 1837 he succeeded to the peerage. In 1840 he fought a duel with one of his officers, was tried by the Lords and acquitted on a technicality. In the Crimean War, as major general in command of the light cavalry, he led the famous charge at Balaklava, Oct. 25, 1854, in obedience to an order which he misunderstood. He was promoted lieutenant general (1861) and received many honors. He published *Cavalry Brigade Movements* (1861).

CARDIGANSHIRE. A maritime county of Wales, on Cardigan Bay, with an area of 688 square miles, half being waste (Map: Wales, B 4). It is an agricultural county; the chief branch of industry is the rearing of live stock. There are some manufactures of coarse woollens, gloves, stockings, and hats. Cardigan is the county town. Among other towns are Aberystwith and Lampeter. Pop., 1891, 63,467; 1901, 61,078; 1911, 59,877.

CARDINAL (Lat. *cardinalis*, pivotal, principal, from *cardo*, a hinge). The highest dignity in the Church of Rome after the Pope, whose elector and counselor he is. The title in the ante-Nicene period was applied to the clergy who were permanently attached to a cathedral church anywhere; but the usage was later restricted to particular members of the clergy in Rome. In the fourth century the priests permanently ruling the parish churches in Rome were styled *cardinal* priests, the deacons permanently administering the charities of a particular "region" of the city were styled *cardinal* deacons, while the bishops in charge of the suburban sees of Rome—viz., Porto and Santa Rufina, Ostia and Velletri, Palestrina, Sabina, Frascati, and Albano—and who were called in consultation by the Bishop of Rome, were called *cardinal* bishops. The word "cardinal" in each case means that the person was, so to speak, one on whom ecclesiastical affairs *hinged*. Till the late Middle Ages the term was used of prominent priests in important churches, as Constantinople, Naples, Milan.

The cardinals are now all appointed by the Pope, and constitute the Sacred College. The Pope is not obliged to consult them, but as a matter of fact does so, and so they share with him in the government of the church. Their number has varied at different times, and was fixed by Sixtus V, in 1586, at 70, i.e., 6 cardinal bishops, 50 cardinal priests, and 14 cardinal deacons. The Pope is not obliged to maintain this number, and there are generally from 10 to 15 vacancies. In 1914 there were but 54 cardinals, of whom 28 were Italian and 26 foreign. The bishops take their names from the suburban sees mentioned above, the priests their titles from the churches in Rome to which they are appointed, while the deacons are appointed to other churches called "deaconries." The first cardinal bishop is the dean of the College, and has the right to consecrate the Pope if he be not at the time of his enthronement; a bishop; the first cardinal deacon is first deacon of the College, and he has the right to proclaim and crown the new Pope. The camerlengo, who rules the church during a papal vacancy, also is a cardinal. All the cardinal bishops, and all but one of the cardinal deacons, live in Rome, but only 11 of the cardinal priests. Most of the cardinals are bishops. A few belong to monastic orders, including one Jesuit.

The cardinals are chief members of the 21 Sacred Congregations, or standing ecclesiastical committees, of the papal government, such as Holy Office, Propagation of the Faith, Index, Rites, and Studies. They meet in consistory, over which the Pope presides. But they are most prominent before the world on the death of the Pope, as they are the electors of his successor, and usually, though this is not obligatory, choose one of their own number. They are princes of the church, enjoying extraordinary privileges and honors, and are entitled "Most Eminent Prince." They wear a distinctive scarlet dress and a red cap, which is put upon their heads by the Pope. They have also a red hat, which is given to them in a public consistory, but is not worn. They enjoy an income out of the papal treasury. They are frequently sent by the Pope as his representatives upon delicate missions, when they are styled *legati a latere*. See DEAN.

CARDINAL, PIERRE. See CARDENAL.

CARDINAL BIRD, or REDBIRD. A large and brilliant finch or grosbeak (*Cardinalis cardinalis*), one of the finest song birds of America, common throughout the southern part of the United States. The general color of the male is red, the head being vermilion, with a small portion around the base of the bill black. The feathers of the crown are long, and erected into a conical crest. The cardinal bird migrates northward in spring, but never farther than Massachusetts, where only a few stragglers are seen. Its loud, clear, sweet, and varied song is to be heard chiefly in the mornings and evenings. Partly because of the song, and partly from its beautiful plumage, the cardinal is a popular cage bird. During the breeding season the male is very devoted to his mate and to the young. The nest is built in bushes, and consists of twigs, rootlets, and strips of bark, lined with grasses and other finer material. The eggs are usually four in number, white or bluish, speckled and spotted with brown. Geographical races of this species extend its range westward to southern California and Mexico, and allied species exist in Mexico and Central America. See Plate of BUNTINGS AND GROSBEEKS.

CARDINAL DE LUGO'S (dā lōō'gōz) POWDER. See CINCHONA.

CARDINAL FLOWER. See LOBELIA.

CARDINAL POINTS. See COMPASS.

CARDINAL VIRTUES. According to the ancients, the virtues of justice, prudence, temperance, fortitude. They were so called because the whole of human virtue was supposed to hinge or turn upon them. In other words, they were considered as a full and comprehensive classification of a man's various duties.

This mode of dividing the virtues is to be found as far back as Socrates. The ancient moralists treated under ethics the whole sum of human duty and virtue. Thus, Aristotle considers the great problem of the science to be the determination of man's highest good, together with the means of realizing it. Hence, he includes both the social virtues and the prudential regard to the welfare of the individual in the same scheme. Of the four cardinal virtues, it will be seen that the first, justice, is the social virtue; that prudence (which, properly speaking, includes temperance also) regards the well-being of the individual; while fortitude is necessary to both. This last was a virtue greatly esteemed in the ancient world; each one's

lot being much less secure than with us in the present day, it was impossible to say what sufferings might be in store for the most prosperously situated of men.

Dr. Whewell has made an attempt to correct the more obvious defects of the classification, and has substituted one which he deems free from those defects. The most notable omission in the ancient scheme, judged from the modern point of view, is the absence of all reference, either expressly or by implication, to the virtue of goodness or benevolence. Accordingly, to adapt the classification to the altered point of view, benevolence has to be added to the list. This is Dr. Whewell's first virtue; the others are justice, truth, purity, and order. But the scheme, as thus amended, is scarcely less objectionable than before. The virtue named last, order, which means obedience to authority, cannot but contain a very large portion of all the rest; seeing that justice, truth, etc., are enjoined by positive law. Then, what is understood by purity, including the control of the two powerful appetites—hunger and sex—is partly prudential and partly social.

In Roman Catholic systems of theology there are declared to be four *cardinal virtues*—"prudence, fortitude, temperance, and justice"—from which all other "moral" virtues are represented as flowing. But there is a prior division of virtues into the two classes of *theological* and *moral*, the theological virtues being faith, hope, and charity. The distinction between these two classes is represented as consisting in this, that the theological virtues "*immediately* regard God," and the moral virtues do not immediately regard God, but are commanded and rewarded by God, and are beneficial to ourselves.

This method of discussion may be said to be engaged upon the form of the virtues. There is need of one which shall touch their matter. The tendency of ethics during the nineteenth century in America was to emphasize love as the true "cardinal" virtue or as the element which must enter into every moral act in order that it may acquire the character of virtue. Even forms of philosophy which have seemed to ignore this principle have brought it in again under other names, such as "altruism." That modern tendency which has emphasized "self-realization" as the watchword of ethics has plainly seen that the true realization of self is its fullest adjustment to all its environment, and that this involves regard to the self-realization of every other moral being, which is what is meant by love.

Considered under the light of this principle, as the informing and controlling principle of all action that is really good, the cardinal virtues assume more distinctness. Love regards the fundamental interests of all moral agents as the object of moral effort, or it seeks to do in every case that which will give the fullest possible amount of good to all concerned. But this is exactly what justice is—not the apportioning out of something good or bad upon the basis of an abstract and unreal standard, but the rendering to each that which shall now and here promote most fully the best good of each, while also promoting the best good of all. The same is true, *mutatis mutandis*, of the remaining virtues. A classification of virtues into the personal and the social may be valuable for certain purposes, but personal acts are virtues only as they have respect also to social relations, and vice versa.

In fact, no virtue is such in isolation from others, or in disregard of the totality of concrete conditions. See ETHICS.

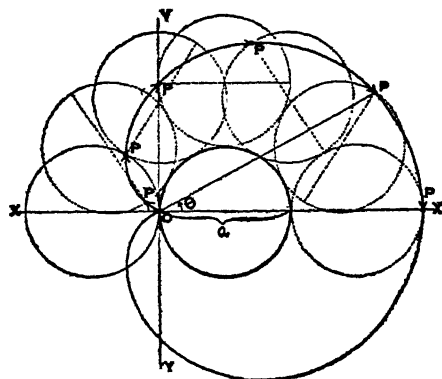
CARDINAL VON WID'DERN, kâr'dê-nûl' fôn vid'dêrn, GEORG (1841–). A German writer on military science, born at Wollstein (Posen). He fought in the Prussian army in the campaign of 1866 and in the Franco-Prussian War. Subsequently he was head of the military school at Neisse. He retired from the service with the rank of colonel in 1890. His numerous publications include *Handbuch für Truppenführung* (3d ed., 1881–84), which appeared in a fourth edition as *Heeresbewegungen und Märsche* (1892); *Das Gefecht an Flussübergängen, und der Kampf an Flusslinien* (1890); and *Kritische Tage* (part i, vols. i–iii, 1897–1900); *Verwendung und Führung der Kavallerie 1870–71* (1903); *Eroberungszüge der Polen im heutigen Deutschland* (1912).

CARDING. The process of disentangling and arranging in parallel rows the fibres of cotton, wool, or flax, by the action of wire-toothed cylinders, and the first important mechanical operation in the treatment of fibres preparatory to yarn making. This operation may be compared to the combing and brushing of one's hair, and the *card* combines the properties of the comb and brush, being a brush with wire teeth instead of bristles. These teeth are inserted in strips of leather, called card clothing, which are fixed upon the surface of a revolving cylinder. This arrangement, known as a carding engine, was invented in 1738 by Lewis Paul, a Birmingham mechanic. In the modern machine several such cylinders are arranged so that the ends of the teeth are nearly in contact; and the material, which has previously been formed into *laps*, the width of the cylinders, being brought to them, is caught up, passed from one to the other, and combed out as the cylinders revolve, in the form of beautiful films or fleeces, which are removed by a smaller drum card, called the "doffer," and again from this by the "doffing knife." These films, which are of the width of the drum, are next contracted to a narrow rope or ribbon by being passed through a funnel; and are called the "card ends" or "slivers," and are now ready for "drawing" or "doubling." Carding machines for wool are usually arranged in series of three, called *first breaker*, *second breaker*, and *finisher*. For cotton there is one main cylinder with revolving flats. A double-cylinder arrangement is used for worsted. For coarser materials, fewer small cylinders are required. Consult Murphy, *The Textile Industries*, vol. ii (London, 1912). See SPINNING, and the authorities there mentioned.

CARDINIA (Neo-Lat. nom. pl., from Gk. *kapdia*, *kardia*, heart). An extinct genus of lamellibranchs found fossil in rocks of Triassic and Jurassic age in Europe. Its shell resembles in form that of the common little-neck clam, but is slightly longer and of more solid build, with a smooth or concentrically marked outer surface, and without the pearly inner surface. In cross section the two valves are heart-shaped, whence the name. The shells of this genus, of which less than a dozen species are known, are common in the lower Lias of Great Britain.

CARDIOGRAPH. An instrument for registering the heart's action. It is adjusted over the heart's apex as a sphygmograph (q.v.) is adjusted over an artery.

CARDIOID (Gk. *καρδία*, *kardia*, heart + *εἶδος*, *eidos*, shape, form). A heart-shaped curve traced by a point of the circumference of a circle that rolls around another circle of the same diameter. The curve was first studied early in the eighteenth century, and is a special case of Pascal's limaçon (q.v.). Referring the



CARDIOID.

cardioid to rectangular coördinates so that the *x*-axis coincides with the diameter of the fixed circle and the *y*-axis is tangent to it, the equation of the cardioid is $(x^2 + y^2 - ax)^2 = a^2(x^2 + y^2)$ where *a* denotes the diameter of the circle. The polar equation is $OP = \rho = a(1 + \cos \theta)$. The origin is a cusp. (See CURVE.) The curve is symmetric with regard to the *x*-axis, and its area is $\frac{3}{2}\pi a^2$, or six times the area of one of the circles. See CYCLOID.

CARDITIS (Neo-Lat., from Gk. *καρδία*, *kardia*, heart). An old name for degeneration of the muscles of the heart. It is now termed myocarditis. See HEART, DISEASES OF THE.

CARDONA. A town of Spain, in the Province of Barcelona. It is situated on the right bank of the Cardoner, about 44 miles northwest of Barcelona, and is surrounded by walls, pierced with six gates and commanded by a castle (Map: Spain, F 2). It has an old church, and in its vicinity is situated the celebrated Montaña de Sal, a hill about 265 feet high, composed of rock salt, which shines brilliantly under the rays of the sun. The salt is worked on a large scale and gives employment to many of the inhabitants. Pop., 1900, 3900; 1910, 4002.

CARDON' FORESTS. See CACTUS; CARDOON.

CARDOON' (OF. *cardon*, from ML. *cardo*, thistle, Lat. *carduus*, thistle), *Cynara cardunculus*. A perennial plant of the same genus with the artichoke (see illustration in article SALAD PLANTS). It is a native of the southern part of Europe and the northern part of Africa. It has long been in cultivation in Europe as an annual for the sake of the blanched leafstalks and midribs of the leaves, which are used as a salad, or more generally as a boiled vegetable during winter. It is but little grown in the United States.

CARDOSO, kār-dō'sō, JOSÉ JOAQUÍN (1802-78). A Mexican jurist and botanist. He was born at Puebla, and graduated as a lawyer at the Colegio de San Ildefonso, Mexico City, in 1828. When the secret society *Los Polkos* was organized by the Conservatives, during Santa Anna's administration, Cardoso established a lodge in opposition to it, which he called *La*

Escocesa, and which exerted considerable influence. From 1851 to 1854 he was professor of Latin. In 1854 he was a member of the Liberal convention which prepared the plan of Ayutla, and in 1857 he became a deputy to the First Congress. He repeatedly declined the portfolio of justice tendered to him by his friend, President Juárez, preferring to devote himself to botanical investigations and literary studies. In 1868 he became director of the San Augustin Library (now the National Library), an institution containing thousands of books acquired largely from the convents of Mexico. Cardoso also made several scientific excursions to Popocatepetl and Orizaba, discovering and collecting many plants which he subsequently classified. Among his botanical and biographical works may be mentioned: *La herbolaria mejicana*; *La flora entre los Aztecas*; *El método de Humboldt*; *Linneo el Joven*; *Cuál fué la primera planta medicinal entre los antiguos*; *Autobiografías mejicanas*.

CARDS (Fr. *carte*, card, ML. *carta*, *charta*, card, Lat. *charta*, paper, from Gk. *χάρτιν*, *chartē*, leaf of paper). Cards for playing games of chance are of the most remote antiquity and of almost universal usage. There is evidence that they were in use in Egypt in the time of Joseph, but they did not appear among the Jews until after their return from the Babylonian exile. That their use extended as far east as Hindustan and China at a period long before their introduction into Europe is well attested. The Chinese dictionary, *Ching-tze-tung* (1678), states that they were invented for the amusement of Sèun-ho's concubines in the year 1120 A.D. Though it is rather likely that they were known to a few individuals in Europe about the middle of the fourteenth century, probably they were not commonly used until about the first of the fifteenth. There are two theories as to who brought them into Europe. Some antiquarians maintain that they followed in the wake of the invading Saracens, who, after having spread over Asia and Africa, crossed the Mediterranean in 711. Others claim that the Crusaders brought the practice of playing cards from the East, where they had of course come in contact with the Saracens. Gambling was certainly rife among the Crusaders. From whatever source playing cards came, every nation of Europe used them, and that they had the same point of origin is pretty conclusively proved by the uniformity of the words by which they are known, both among Teutonic and Latin races. When, however, the details of a pack are named, the nomenclature varies, just as the design and the number of cards in a pack have varied. With the Anglo-Saxons the world over it is 52 in four suits of 13 each, i.e., king, queen, jack, and 10 cards, from 10 to 1, according to the number of pips. In Italy 36 cards formed a pack, and the older characteristically German cards were only 32. In China, where the early Portuguese missionaries found cards in common use, a pack consisted of 30 cards in three suits of 9 each, and three superior cards. Their cards were not more than half as wide as the European variety, and were called by the very expressive word *shen*, meaning a fan, evidently a suggestion taken from an outspread hand of cards. In Hindustan the early pack consisted of 10 suits of 12 each, the marks of each of the 10 suits being emblematic of one of their avatars or incarnations of Vishnu. In this sym-

bolic respect the cards of all nations have varied from time to time. Some have been historic, some have been political satires; some have lampooned particular people; some have represented class distinctions—for instance, the early Italian and Spanish packs, instead of the modern hearts, clubs, diamonds, and spades, had swords to represent the nobility, chalices for the clergy, coins for the citizens, and clubs or staves for the peasantry. A description of the artistic embellishment of the faces of cards would alone form a volume; among the devices were horsemen, elephants, hawks, bells, flowers, many birds, tumblers, and a host of other subjects. The four kings seemed at one time likely to lose their sway over the New World, for cards were manufactured in New York in 1848 which had neither kings nor queens, the president of hearts being Washington, of diamonds John Adams, of clubs Franklin, and of spades Lafayette. The queens were Venus, Fortune, Ceres, and Minerva, and the knaves Indian chiefs.

Spain introduced cards into the New World. Herrera mentions that when Cortés conquered Mexico King Montezuma took great pleasure in watching the Spanish soldiers play cards. Spain was more devoted to cards at that time than any other European nation. Although generally known, they were not common. Neither Petrarch, who described the social life of the first half of the fourteenth century, nor Chaucer, who depicted the second half, mentions cards, although they describe many other games of chance. By the middle of the next century their manufacture, even in England, had become quite a trade, for on the rolls of Parliament there is a petition, which was complied with, prohibiting their importation from abroad.

Even the names of most of the old games are only to be found in antiquarian works. Chief among them was one named, in every country where it was played, "primero." It found its way into Shakespeare, whose Falstaff says: "I never prospered since I forswore primero." It long continued a fashionable game, but was succeeded in general estimation by mauve, and piquet still survives. "Loadam," "Noddy," "Macke," "Oubre," "Gleeke," "Post and pan," and "Bank-rout" are but ghosts out of the writers of the eighteenth and early nineteenth centuries.

A detailed description of the modern games of cards will be found under their distinctive titles. Consult: Singer, *Researches into the History of Playing Cards* (London, 1816); Chatto, *Origin and History of Playing Cards* (London, 1848); Willshire, *Descriptive Catalogue of Playing and Other Cards in the British Museum* (London, 1876); Taylor, *The History of Playing Cards* (London, 1865); R. Merlin, *Origine des cartes à jouer* (Paris, 1869); Van Rensselaer, *The Devil's Picture Books* (New York, 1890); id., *Prophetical, Educational and Playing Cards* (Philadelphia, 1912); Jessel, *Bibliography of Works in English on Playing Cards and Gaming* (London, 1905); D'Allemagne, *Les cartes à jouer* (Paris, 1906), a very detailed account.

CARDUCCI, kār-dō'chē, GIOSUÈ (1835-1907). The greatest Italian poet of the second half of the nineteenth century, professor at Bologna, senator of the kingdom, winner of the Nobel prize for literature in 1906. As a critic he passed in review the whole course of Italian literature, raising unsuspected problems of history and criticism, himself making important contributions to knowledge and stimulating a whole

school of investigators to sounder methods of research and to keener appreciation of Italian letters. Meanwhile Carducci was producing a richly varied series of poems which reveal him as one of the solidest and most fibrous spirits of modern Italy. In *Juvenilia* (1850-60) we find already hints of the various motives that in more elaborate working become distinctive of his later poetry; a passionate devotion to the classic world; a determination to assimilate again the ancient spirit, which with fiery arrogance he exalts over the indolence and mediocrity he sensed about him. So with Italy before him as the modern Athens and the modern Rome, he glorifies the great writers and the great patriots of his country. In *Levia gravia* (1861-71), with greater composure and a freer lyric hand, he continued much in the same manner. In 1863 appeared the sensational, impudent, and eloquent *Ode to Satan*, where Carducci, identifying Hellenic beauty, the spirit of learning and revolt, human heroism, modern scientific triumph, in short all progress, with the Spirit of Evil, celebrates the victory of Satan over the "Jehovah of the priests," who symbolizes ignorance, tyranny, and oppression. And with greater violence still in *Giambi ed epodi* (1867-79) he assails the temporal power of the Pope in alliance with the oppressors of Italy. Mingling in the *Intermezzo* the most biting satire against the romantics with some of the mellowest cadences of modern Italian poetry, Carducci passes (1861-87) to the *Rime nuove*, where, now free from the strife of the revolution, he unfolds with greater amplitude the manifold aspects of his genius, enthroning his beloved "antichità serena" in the "Hellenic Springtimes" (*Primavera elleniche*), chiseling the most graphic portraits of material reality in "The Ox" (*Il bove*), expressing the deepest sorrows of death (*Pianto antico* and *Funere mersit acerbo*), extracting from history, literary, and art essences of varied personality and subject. One of the most remarkable of this remarkable series is the *Ca ira*, where, in 12 sonnets, he sums up in its most crucial moments the French Revolution, producing a startling effect of movement, violence, and enthusiasm.

It is, however, in the *Odi barbare* and in their continuance, *Rime e rimi* (1880-1900), that Carducci's full power was shown. The suppression of rhyme and the first great adaptations of classic metres in Italian literature aroused among critics wide discussion of these poems. Recently they have provoked a searching critical literature far exceeding in bulk that devoted to any modern poet, and though their richness in substance and depth of coloring make them almost beyond translation, they have been rendered into all the great languages of Europe. Here all the motives of the earlier poems reappear, but they are now worked out to their fullest possibilities. The classic spirit is here given a living body, arrayed in a splendor of imagery (*All'Aurora*) and assimilating in itself all the passions and ideals of a modern man. The whole essence of Italian history is concentrated in the ode *Alle fonti del Clitumno*. Here, as in the *Ode to Satan*, Christianity is portrayed as a destructive force extinguishing the light of ancient civilization and the greatness of Rome. In the ode *In una chiesa gotica*, also, Carducci contrasts the airy visions of paganism with the terrors of Christian asceticism and the horrors of the Christian hell. The poet himself seems

to have been conscious of some one-sidedness in these views, for in the ode to *La chiesa di Polenta* he credits Christianity with being the amalgamating force of ancient and modern, of barbarian and Roman, in Italian history, and, following out a motive of Alceardi, works around the *Ave Maria* of the ritual all the emotional tenderness of faith. *Alla stazione* ('At the Railroad Station') is considered one of the masterpieces of realistic poetry. Most of these odes are densely packed with substance; they call out all the emotional and intellectual resources of the reader, invariably reflecting a vast erudition, a keen interpretation, and a vivid application to life, on the part of the author. Carducci as a personality represents the highest ideals of the new Italian nation; coming before the most recent developments of the revolutionary spirit, he stood for free individualism under just government, free thought guided by sound learning, sincerity in art and breadth of culture. The best translation of Carducci's poems is by Bickersteth (New York, 1913). (Consult: Jeanroy, *Giosuè Carducci* (Paris, 1910); Chiarini, *Memoire della vita di Giosuè Carducci* (Florence, 1903); B. Croce, *Giosuè Carducci* (series of articles in the *Critica*, with bibliography).

CARDWELL, EDWARD (1787-1861). An English clergyman and ecclesiastical historian. He was born at Blackburn, Lancashire, 1787; educated at Oxford, received the degree of M.A. in 1812 and of D.D. in 1831. In 1826 he was chosen Camden professor of ancient history. He edited the *Ethics* of Aristotle (2 vols., 1828-30), with notes, and wrote lectures on *The Coinage of the Ancient Greeks and Romans* (1833). In 1831 he was made principal of St. Alban Hall, and held the place until his death there, May 23, 1861. Among his other publications were a student's edition of the Greek Testament (1837); Josephus' history in Greek and Latin (1837); *Documentary Annals of the Reformed Church of England from 1546 to 1716* (1839); *History of Conferences, etc., Connected with the Revision of the Book of Common Prayer, 1558 to 1690* (1840); *Synodalia, a Collection of Religious Canons, and Proceedings of Convocation from 1547 to 1717* (1842); and *Reformatio Legum Ecclesiasticarum* (under Henry VIII-Elizabeth) (1850).

CARDWELL, EDWARD, VISCOUNT (1813-86). An English politician. He was born in Liverpool, the son of a merchant, was educated at Winchester and at Balliol College, Oxford, and was admitted to the bar in 1838. He devoted himself to politics, however, and entered Parliament in 1842. There he attached himself to Sir Robert Peel, who chose him Secretary of the Treasury in 1845 and President of the Board of Trade in 1852. He was subsequently Chief Secretary of Ireland (1859), Chancellor of the Duchy of Lancaster (1861), and Secretary of State for the Colonies (1864), working towards Canadian federation in the last-named post. In Gladstone's cabinet (1868) he became Secretary of War; and his reforms included the abolition of the purchase of commissions, the retirement of officers, short terms of service, the localization of regiments, and improvements in military education. In 1874 he was raised to the peerage. With Earl Stanhope, he was one of the literary executors of Sir Robert Peel, and one of the editors of the *Peel Memoirs* (1856-57).

CARELESS HUSBAND, THE. A comedy

of intrigue by Cibber, produced Dec. 7, 1704, at Drury Lane, and printed in quarto in 1705. It treats of the straying of Sir Charles Easy from the paths of virtue and his final restoration to them through the patient forbearance of his excellent wife.

CARELESS LOVERS, THE. A comedy by Edward Ravenscroft, produced at Dorset Garden in 1673 and published the same year. It is partly founded on *Monsieur de Pourceaugnac* and contains an attack on Dryden's *Assignment*.

CARÈME, ka'ram', MARIE ANTOINE (1784-1833). A famous French cook. He was born in Paris and became *chef de cuisine* to many celebrated persons, including Talleyrand, King George IV, and one of the Rothschilds. He cooked for the Congress of Aix-la-Chapelle, Vienna, and Laibach. He left several works on subjects connected with cookery, which include: *Le pâtissier pittoresque* (1815); *Le pâtissier royal parisien* (1825); *Le maître d'hôtel français* (2 vols.); *Le cuisinier parisien* (1828).

CARET, ka'râ' (Neo-Lat. *caretta*, from Sp. *careta*, pasteboard mask, dim. of *cara*, face, Gk. *kápa*, *kara*, Skt. *siras*, head). A turtle. See **HAWKSBILL TURTLE**.

CAREW, ká-roo', GEORGE, BARON CAREW OF CLOPTON AND EARL OF TOTNES (1555-1629). An English soldier and statesman. He was educated at Oxford and joined the army, holding an important command in the Irish wars against the Earl of Desmond. He filled several offices, among them that of President of Munster, and was an intimate friend of Sir Walter Raleigh, whose life he tried to save in 1618. The powerful support that he gave to Lord Mountjoy enabled the latter to overcome O'Neil, Earl of Tyrone, and his Spanish allies. For these services he was raised to the peerage and made a privy counselor, and in 1626 Charles I created him Earl of Totnes. He had antiquarian tastes and carefully preserved many manuscripts relating to Ireland. *Pacata Hibernia, or the History of the Late Wars in Ireland*, published after his death, is often ascribed to him, though it was written by his secretary (probably not his natural son), Sir Thomas Stafford, from Carew's papers.

CAREW, RICHARD (1555-1620). An English poet and antiquarian. At Oxford, when he was only 14, he disputed extemporaneously with Sir Philip Sidney, in the presence of an audience of noblemen. He was a member of Parliament, high sheriff of Cornwall, and the author of a *Survey* (1602) of that county, which still has considerable value, topographic and philological. He translated from the Italian in crabbedly close English the first five cantos of Tasso's *Jerusalem Delivered* (1594) and from an Italian version of Huarte de San Juan *The Examination of Men's Wits*.

CAREW, THOMAS (?1598-?1638). An English poet. Of his life very little is known. He was a son of Sir Matthew Carew, of Middle-Littleton, Worcestershire, a master in chancery, and was born probably in 1598. From Westminster School he went to Corpus Christi College, Oxford, but left about 1615, without a degree. "Afterwards," says Anthony Wood, "improving his parts by traveling and conversation with ingenious men in the metropolis, he became reckoned among the chiefest of his time for delicacy of wit and poetic fancy. About which time, being taken into the Royal Court for his most admirable ingenuity, he was made Gentleman of

the Privy-Chamber . . . to King Charles I." The King bestowed on him the royal domain of Sunning Hill, a part of Windsor Forest. He was the first of a group of lyrists, often classed as Cavalier poets, to the making of whom two influences contributed: the Elizabethan lyrists, especially Ben Jonson, and Dr. Donne (q.v.). Carew's theme is love, which is treated with great frankness and with a luxuriant imagination. His verses are often very sweet and beautiful. He published, in 1634, a masque entitled *Cœlum Britannicum*; but his poems did not appear until 1640, some time after his death. Recent editions are by Hazlitt, for the Roxburghe Library (London, 1870); by Ebsworth (London, 1893); and by Vincent for the Muses Library (London, 1899). The last-named editor would identify the subject of this sketch with the Thomas Carew who entered Merton College, Oxford, in 1608, at the age of 13, and received the degree of B.A. in 1611. He also argues for 1639 as date of death. *Poems*, edited by Arthur Vincent in 1899, is the best edition of Carew.

CAREX. See CYPERACEÆ.

CAREY, HENRY (c.1692-1743). An English humorous poet and musician, born in London. He was a reputed son of George Saville, the famous Marquis of Halifax. After studying music under Linnert, Roseingrave, and Geminiani, he taught for a living, and wrote a number of musical dramas and ballad operas. He was the author of the libretto of *The Dragon of Wantley*, music by Lampe (London, Oct. 26, 1737), and he also published six cantatas (1732) and *The Musical Century, or a Hundred English Ballads* (1737; 3d ed., 1743). He will be remembered as the author of the ballad "Sally in our Alley" and of "God Save the King" (1740), the authorship of which latter was long regarded as doubtful until Chrysander substantiated the claims first brought forward by Carey's son.

CAREY, HENRY CHARLES (1793-1879). An American economist, born in Philadelphia, son of Mathew Carey. In 1835 he published an essay on the *Rate of Wages*, which was expanded into the *Principles of Political Economy* (1837-40). This work, which accepted in the main the free-trade principles of the English school, rejected the Ricardian doctrine of rent and the Malthusian doctrine of population. It defended the theorem of the fundamental harmony of economic interests and by its optimistic note captivated Frédéric Bastiat, whose work was deeply influenced by it. The work also exerted a great influence upon Dühring, who devoted himself for a long period to the dissemination in Germany of Carey's views. In 1838 Carey published *The Credit System of France, Great Britain, and the United States*; and in 1848, *The Past, the Present, and the Future*. In this work Carey abandons the doctrine of free trade. In the *Harmony of Interests, Agricultural, Manufacturing and Commercial* (1851) Carey commits himself to the defense of protection as practiced at the time in the United States. For nearly half a century Protectionists drew heavily upon these and later writings of Carey for the defense of their policy. In 1853 Carey published the *Letters on the International Copyright*; in 1858-59 *Principles of Social Science*; in 1867 *Review of the Decade 1857-67*; and in 1873 *The Unity of Law*. Carey's economic writings are characterized by originality and fervor of conviction, but are very defective in logic. Their

direct influence upon economic science has been negligible; indirectly they have assisted in breaking down the dogmatism with which English economic doctrines were expounded in America.

CAREY, MATHEW (1760-1839). An American author and publisher, born in Ireland. In consequence of publishing an address to the Irish Roman Catholics on their oppression by the penal code (about 1778), he was compelled to leave Ireland, but returned within a year and established, in 1783, the *Volunteer's Journal*. His attacks upon Parliament and the ministry caused his imprisonment in Newgate until the dissolution of Parliament. In 1788 he was aided by Lafayette to emigrate to the United States and settled in Philadelphia, where he founded the *Pennsylvania Herald*, one of the first papers in the country to furnish accurate reports of legislative debates. He was subsequently connected with the *Columbian Magazine* and the *American Museum*. In 1791 he began trade as a bookseller, and, with his sons, built up a prosperous business. During the epidemic of yellow fever in 1793 he was active in the work of relief, and afterward wrote a history of the disease. In 1793 he, with others, founded the Hibernian Society, and in 1796 he assisted Bishop White in establishing the first Sunday-school Society. Carey was a constant writer and published a great number of essays on party politics, political economy, and social questions. Among his favorite ideas were internal improvements and a protective tariff. He died in Philadelphia.

CAREY, ROSA NOUCHETTE (?-1909). An English novelist, born and educated in London, died 1909. Beginning in 1868, she produced a large number of wholesome if not brilliant novels. Various fashions in novel writing have come and gone, but she held throughout to a simple and unaffected chronicle of commonplace folk. Of her work a good specimen is *Other People's Lives* (1897), a collection of short stories. Others are: *Nellie's Memories* (1868); *Robert Ord's Atonement* (1873); *Wood and Married* (1875); *Mrs. Romney* (1894); *My Lady Frivol* (1899); *Life's Trivial Round* (1900); *At the Moorings* (1904); *The Mistress of Brae Farm* (London, 1908).

CAREY, WILLIAM (1761-1834). An English Baptist missionary and Orientalist, born near Northampton, England. At the age of 14 he was apprenticed to a shoemaker, but in 1786 was chosen minister of a Baptist congregation at Moulton, and in 1789 at Leicester. While preaching, he studied Greek, Latin, and Hebrew by himself, and in 1793 was sent as the first Baptist missionary to India by the Baptist Missionary Society, which he had helped to organize. At first he had to accept employment as superintendent of an indigo factory. Nevertheless, he established a church near the factory at Maldah. Five years later he removed to Serampur, a Danish colony. Under his direction this mission before 1832 issued about 200,000 Bibles, or portions thereof, in about 40 Oriental languages or dialects, besides a great number of tracts and other religious works in various languages. A great proportion of the actual literary labor involved in these undertakings was performed by Carey himself, whose *Kashmiri New Testament* (1821) was the first book published in that language. His translations into six Rajasthani dialects were particularly important. His Sanskrit and other Ori-

ental grammars and dictionaries were important works. A valuable Sanskrit dictionary was burned in his printing shop in 1812. Carey's translations of the Bible gave distinctly Baptist versions for words meaning "baptize," etc., and the subsequent controversy with the British and Foreign Bible Society resulted in the foundation (1839) of a (Baptist) Bible Translation Society. He was professor of Oriental languages at Fort William College, Calcutta, from 1800 to 1830. For his biography, consult Culross (London, 1882) and George Smith (London, 1885).

CAR/GILE MEMBRANE is a sterile membrane prepared from the peritoneum of the ox, and is used in abdominal surgery to interpose between raw surfaces and thus prevent the formation of adhesions. It is also used to envelop freshly sutured nerves or tendons, and to protect wounds.

CARGILL, kār'gil, DONALD (1610-81). A Scottish covenanting preacher. He was educated at Aberdeen and St. Andrews, and in 1655 became pastor of a church in Glasgow. For calling the restoration of Charles II a public calamity he was deprived of his church and banished beyond the Tay. He was wounded in the battle of Bothwell Bridge, but made his escape; and soon he joined Richard Cameron in publishing the Sanquhar declaration, excommunicating Charles II, the Duke of York, and various high officials. He was arrested and beheaded in Edinburgh.

CARGO (Sp., burden, Fr. *charge*, from ML. *caricare*, to load a car, from Lat. *carrus*, car). A general term for all merchandise carried on board a trading ship. Sometimes it is applied also to the invoice of the cargo. The term *deck cargo* is given to the commodities on deck, which are not usually included in the policy of insurance. For the security of the customs revenue, the master of every coasting vessel is bound to keep a *cargo book* recording the name of the vessel, the name of the owner, the port of departure, the port of destination, the goods taken, the names of the shippers and consignees, the time of departure, and other particulars. The customhouse officers may demand to see this book at any time. See **FREIGHT**; **MEASUREMENT OF SHIPS FOR TONNAGE**; **SHIP'S PAPERS**; ETC.

CARHART, HENRY SMITH (1844-1920). An American physicist and university professor. He was born at Coeymans, N. Y., March 27, 1844, and graduated from Wesleyan University in 1869. He pursued graduate studies at Yale, Harvard, and Berlin, and after serving as professor at Northwestern University, was appointed to the faculty of the University of Michigan in 1886, where he remained until his retirement as professor emeritus in 1909. Professor Carhart devoted himself largely to the study of electricity, particularly the subject of standard cells and primary batteries, one of the best types of the former having been devised by him and known as the Carhart-Clark cell. (See **VOLTAIC CELL**.) Professor Carhart has been a delegate from the United States to several international electrical congresses, including those at Chicago, 1893, and at St. Louis, 1904, and was delegate of the United States to international conferences on electrical units and standards at Berlin, 1905, and London, 1908. He was president of the board of judges in the department of electricity at the World's Columbian Exposition in Chicago in 1893. He

is the author of *Primary Batteries* (1891), a standard treatise on this subject; *University Physics* (1894-96); *Electrical Measurements* (1895); *High School Physics*, with H. N. Chute (1901); *College Physics* (1910); and other textbooks and treatises.

CARHEIL, kār'ra'y, ETIENNE DE (?-1726). A Jesuit missionary among the Huron and Iroquois Indians of Canada from about 1668 to about 1721. For many years he was superior of the Indian mission at Michillimackinac, but, in spite of his knowledge of Indian languages, he met with little success, and in 1701 most of his converts left him to live in the new settlement at Detroit.

CAR/IA (Lat., Gk. *Karla*, *Karia*). In ancient geography, the southwesternmost country of Asia Minor, bounded on the north by Lydia, on the east by Phrygia, on the southeast by Lycia, and on the west and southwest by the Mediterranean. Before the Macedonian conquest, Caria was cut off from the sea on the west by Ionia and on the southwest by the Dorian colonies. A large portion of Caria is mountainous. The chief ranges were the Cadmian and the Latmian. The chief river was the Mæander, famous for its windings. Caria was, at an early date, governed by petty princes or kings; it afterward became a part of the Persian Empire, the former princes continuing to rule as satraps; later it came into the hands of the Macedonian kings of Egypt; and, finally, into those of the Romans. The chief towns were Cnidus, Halicarnassus, Priene, and Miletus. In the early history of the Aegean lands, the Carians are frequently mentioned, and the Greek writers seem to have believed that they were of the same race as the pre-Hellenic inhabitants of Attica and some of the islands. Many modern ethnologists also hold that the Carians were the remnant of the early population of the Aegean.

CARIACO, ká-ryá'kó. A seaport of Venezuela, situated 5 miles from the head of the Gulf of Cariaco, 40 miles east of Cumana (Map: Venezuela, E 1). It is the centre of a fertile district and has considerable coastwise trade. The gulf is very well sheltered, being open only to the westward. Cariaco was founded about 1600. Pop., about 7000.

ÇARIAMA, sà'rè-à'mà (Brazilian), or **SER/EMA**. A bird, *Cariama cristata*, allied to the cranes, but also resembling certain raptorial birds, and now generally ranked in a separate suborder, **DRCHOLOPHI**, placed near the cranes and bustards and more precisely between the trumpeters and the extinct *Phororhacos*. It is a native of Guiana, Brazil, and Paraguay, inhabiting open plains and the outskirts of forests, where it feeds chiefly on serpents, lizards, and insects. It is larger than the common heron; the plumage is brown, finely waved with darker brown, whitish on the lower parts. When pursued, the çariama seeks safety by running and does not readily attempt to use its wings. Its low notes resemble those of a young turkey, but it has the power of making a most tremendous outburst, thereby giving it the well-deserved name of "screamer." This is a series of metallic, high, harsh cries which can carry for many hundreds of yards. Two birds usually unite in giving this performance. It is much esteemed for the table and is sometimes reared in a domesticated state. W. H. Hudson, the Argentine naturalist, considers it related to one of the great extinct birds of Patagonia, *Phoro-*

rhacos inflatus, as closely as armadillos are related to *Glyptodon*. Consult *Proceedings Zoological Society of London* for 1889 and 1899. See Plate of CRANES, ETC.

CAR'IB. A predatory and warlike people from whom the Cariban stock takes its name, formerly occupying most of the Lesser Antilles, by conquest or expulsion of the original Arawakan tribes. They had come from the southern mainland, being expert seamen. Like nearly all the tribes of this stock, they were distinguished for ferocity and cruelty, and were also addicted to cannibalism, the very word *cannibal* being a derivative from their tribal name. To put an end to the chronic disturbances occasioned by their presence, the English government, in 1796, deported almost all the members of the tribe from Dominica and St. Vincent to the island of Ruatan on the coast of Honduras, whence they have since spread over the neighboring mainland to the number of several thousand. From admixture with the negroes, a part of them are distinguished as Black Caribs. Consult Adam, "Le Caraïbe du Honduras et le Caraïbe des Isles," in *Internat. Amerik.-Kongr.*, vol. xiv, pp. 357-371 (1904); J. N. Rat, "The Carib Language as now Spoken in Dominica," in *Journ. Anthropol. Inst.*, vol. xxvii, pp. 293-315 (London, 1897-98).

CARIBAN STOCK. One of the most important linguistic stocks of South America, its tribes holding at the time of the discovery nearly the whole coast and midland region of Venezuela and British Guiana, including the lower Orinoco, together with the Lesser Antilles. Everywhere they were distinguished as a warlike race, the terror of their weaker neighbors, who were steadily retiring before them. In spite of their exceptional cruelty, they are described as "the strongest, handsomest, and most intelligent" of all the natives of that portion of the continent. They were expert boatmen, making use of the sail, a thing unknown among the other tribes, and, in fleets sometimes numbering 100 canoes, were accustomed to ascend the Orinoco, destroying everything before them. They were partly agricultural and made excellent pottery. The present distribution of the principal Cariban tribes is as follows: On the river Guaporé in the State of Matto Grosso, Brazil, are the Palmellas, the most southerly members of the stock. The Bakafris and the Nahuquas dwell on the upper Xingú; on the lower Tocantins, the Apiaca; on the Paranahyba, the Pimenteira. In Brazilian Guiana are the Apalai and Wayawai; in French Guiana, the Roucouyennes and Galibis; in Dutch Guiana, the Trio, Upurui, and Kalinas; in British Guiana, the Macusi, the Accawai, etc.; and in Venezuela, the Maguiritares, Ipuricotos, Maiongkongs, Kirishanas, and Motilonas; in Colombia, the Carijonas, Hianacotos. The modern Caribs differ from the ancient Caribs of the Antilles in their more peaceful mode of life, the absence of cannibalism, and a less highly developed system of social relations. In place of the communal dwelling which formerly prevailed among them, each family at present occupies a separate house, sometimes built on piles as a safeguard against flood. They have a ceremonial religion and practice the couvade (q.v.). Their favorite weapon is a battle-axe of polished stone. On the Cariban stock the writings of Adam, Condreau, Crevaux, Ehrenreich, Ernst, De Goeje, Koch-Grünberg, von den Steinen, etc., should be consulted. In

Dr. Koch-Grünberg's monograph "Die Hiánakoto-Umaua," in *Anthropos*, vol. iii, pp. 83-104, 297-335, 952-982 (1908), is a list (pp. 90-95) of vocabularies and dictionaries in the various Cariban dialects. Consult also the same author's *Zwei Jahre unter den Indianern* (Berlin, 1909-10) for some of the less-known tribes of southwestern Venezuela, northwestern Brazil, and southeastern Colombia.

CAR'IBBEAN SEA. A portion of the north Atlantic, bordered on the south by Central America, Colombia, and Venezuela, on the west by Central America and Yucatan, and partially inclosed from the ocean on the north and east by the island loop of the Greater and Lesser Antilles. It communicates at its northwestern extremity with the Gulf of Mexico by the Yucatan Channel—a passage 120 miles wide between Cuba and the Peninsula of Yucatan. The South American coast of the Caribbean Sea is diversified by the gulfs of Paria, Cariaco, Triste, Venezuela, and Darien, while on the west coast there are the larger embayments of the Mosquito Gulf and the Gulf of Honduras. The Gulf of Venezuela, between the Goajira Peninsula in Colombia and the Paraguaná Peninsula in Venezuela, connects by means of a shallow channel with the Lake of Maracaibo, the basin of which is the most prominent indentation on the north coast of South America. Although the Caribbean is a partially inclosed sea and lies on the border of a great land mass, it occupies a very deep depression. With the exception of a narrow shelf along the Venezuelan coast and a bank that reaches from Jamaica to Honduras and Nicaragua, the entire basin exceeds 6000 feet in depth, and a large portion is more than 12,000 feet. Extreme depths exceeding 16,000 feet have been found off the south coast of Cuba and between Haiti and Venezuela. The waters of the Caribbean Sea are influenced in their circulation by oceanic currents, and particularly by the north equatorial current, which enters the sea from the southeast. There is also a marked current in the northern part, which passes through the Yucatan Channel into the Gulf of Mexico. The Caribbean Sea receives the drainage of a great portion of Central America, but of only an inconsiderable portion of South America, as the Andean Cordillera of Colombia and Venezuela turns the drainage of these countries towards the Orinoco, which enters the Atlantic. The islands of the Caribbean are grouped along the South American coast and along the bank from Jamaica to Honduras. They are small and unimportant. With the opening of the Panama Canal the Caribbean Sea comes into new prominence. The points available for naval strategy are the following: the naval base which the United States occupies at Guantanamo Bay, Cuba; the British base of Bermuda, with Jamaica as a secondary station, which has been restored to the active line; the Danish West Indies, at present unoccupied, but offered twice to the United States and regarded as within the sphere of American influence. The Caribbean has become the object of popular winter voyages from New York.

CAR'IBBEE BARK. See EXOSTEMMA.

CAR'IBBEE ISLANDS. A name sometimes given to the Lesser Antilles. See ANTILLES.

CARIBE, ká-ré-bá (Sp., Portug., from West Indian *carib*, valiant man). Any of several voracious serrasalmonine fresh-water fishes of South America, often of strange form and dis-

tinguished by having the belly serrated with sharp spines. The best known is the piraya (*Serrasalmo piraya*). Gunther (*Introduction to the Study of Fishes*, Edinburgh, 1880) says that though most are of small size, their voracity, fearlessness, and number render them a perfect pest in many rivers of tropical America. "In all the teeth are strong, short, sharp, sometimes lobed incisors, arranged in one or more series; by means of them they cut off a mouthful of flesh as with a pair of scissors, and any animal falling into the water where these fishes abound is immediately attacked and cut to pieces in an incredibly short time. They assail persons entering the water, inflicting dangerous wounds before the victims are able to make their escape. In some localities it is scarcely possible to catch fishes with the hook and line, as the fish hooked is . . . torn to pieces before it can be withdrawn from the water. The caribes themselves are rarely hooked, as they snap the hook or cut the line. The smell of blood is said to attract at once thousands of these fishes to the spot."

CARIBOU, kā'ri-bū. A lake in Maine. See CHESUNCOOK LAKES.

CARIBOU, kā'ri-bū (Canadian Fr., Amer. Indian). A French-Canadian name for the American forms of the reindeer, regarded by zoölogists as varieties of the European *Rangifer tarandus*. (See REINDEER.) Four quite distinct species exist—the common middle-sized, gray, woodland caribou (*Rangifer caribou*), the very small, gray, barren-ground caribou (*Rangifer arcticus*) with about six races, *grœnlandicus*, *pcaryi*, *arcticus*, *granti*, *dawsoni*, and *stonei*. Then comes the huge, black, mountain caribou (*Rangifer montanus*) with its two races, *montanus* and *osborni*, and the white Newfoundland caribou (*Rangifer terrænova*). The first is found throughout the forested region of northern America, where it formerly extended as far south as Connecticut, Pennsylvania, and Colorado, but since the middle of the nineteenth century extends south of Canada only in Maine and Michigan. (See PLATE OF DEER OF NORTH AMERICA.) This has much the same haunts as the mountain and Newfoundland animals. They range the woods and swamps and are especially numerous in Newfoundland, Labrador, and British Columbia; and in winter gather into herds of several hundred, which are able to traverse the snow upon their broad and hairy hoofs and find an abundance of food in leaves and berries (especially cranberries), lichens, etc. In the summer they move about a great deal to escape the flies and at all seasons are the principal dependence of northern tribes of Indians.

The barren-ground caribou is a smaller and paler form, with disproportionately large antlers, and occupies the open country of continental North America to an extreme distance north of the tree growth. It is named *Rangifer arcticus* and is regarded as having a better claim to independent specific rank than any other American form. It is to be found in vast herds in the desolate plains between Great Slave Lake and Hudson Bay, where it subsists upon lichens and migrates southward in the fall to the margin of the forest, returning northward each spring. The Indians and Eskimo gather about these migrations and obtain a winter's supply of meat and skins. The white caribou inhabits the coastal valleys of Greenland. Consult: Shields, *Big Game of*

North America (Chicago, 1890); Roosevelt (et al.), *The Deer Family* (New York, 1902); Grant, "The Caribou," *Seventh Annual Report, New York Zoölogical Society* (New York, 1902); Millais, *Newfoundland and its Untrodden Ways* (London, 1907); Thompson Seton, *Life Histories of Northern Animals* (New York, 1909); and especially Dugmore, *The Romance of the Newfoundland Caribou*, with remarkable photographs, by the author, of the animals in their wild state (Philadelphia, 1913).

CARICA. See PAPAWE.

CARICATURE (Fr., *It. caricatura*, from *ML. caricare*, to overload, exaggerate, from *Lat. carrus*, car). A representation, descriptive or pictorial, in which the peculiarities or natural characteristics of an individual or class are exaggerated, so as to make the object ridiculous. In this article the term is used in its usual significance as applied to the plastic and graphic arts, especially the latter. The two principal kinds of caricature are moral, directed against the habits and customs of individuals and of society, and political, directed against corruption and bad government in the state. To be good, a caricature must possess real traits of the original, exaggerated in a ridiculous sense, but easy to recognize. The artist should have a good sense of form, a ready pencil, and keen observation. To this must be added a considerable knowledge of human nature and of the influences of the passions, habits of life, and modes of thought upon mankind. As caricature does not enter into very high and serious art, neither should the medium or method employed be too dignified or heavy. The use of oil colors might be out of place here, and a certain inattention to studied and accurate drawing is permissible. The touch should be light and skillful, and the medium best employed is perhaps pen or pencil. Caricature probably is as old as man's ability to express himself in the graphic arts. It is said to have existed in Assyria, and certain grotesque figures in the Egyptian papyri are probably caricatures. Though averse to distorting the human figure, the Greeks caricatured their gods and heroes. On a Greek vase "Apollo Arriving at Delphi" is represented as a charlatan of the Greek theatre, and on another, Achilles, intoxicated, is borne on the shoulders of Ajax. We know from the statements of Horace and Cicero that caricature was common in Rome. A fresco found at Gragnano represents Æneas, his father and his son, with dogs' heads and otherwise caricatured. Another like the preceding in the Museo Gregoriano, Rome, represents a philosopher as a pygmy preaching to a fox. Some of the designs called "graffiti," found at Herculaneum and Pompeii, are caricatures. Such a design, found near the Palatine Hill, Rome, represents "Christ on the Cross," with an ass's head, adored by a believer, with the inscription, "Alexamenus, adore thy God."

The grotesque was a marked feature of the art of the Middle Ages, especially during the Gothic period. Caricatures abounded in the illuminations of manuscripts and in the thousands of statues which ornamented the church portals. Satan, Death, and unpopular personages were much satirized, but the Church was by no means spared, the monks receiving an unusual share. The "Dance of Death" (q.v.) was a caricature, on a large scale, of Death dominating all classes of society.

The painters of the Renaissance frequently

made use of caricatures. Those of Leonardo da Vinci, most wonderful drawings, were purely artistic, and without reference to morals or politics. Annibale Carracci used caricature as a weapon against the Naturalists when, in his picture of the Naples Museum, he portrayed Caravaggio, his great rival, as a dwarf with monkeys and parrot. The school of the Carracci produced a number of good caricaturists. Other distinguished Italians of the seventeenth century were Bacio del Bianco in Florence, and Pietro Bellotti in Venice; of the eighteenth century, the Roman artist Pierleone Ghezzi. In Germany, Hans Holbein's "Dance of Death" and his illustrations of Erasmus' *Praise of Folly* were caricatures of the highest artistic order, and Lucas Cranach's prints ridiculing the Pope and Catholicism were of the widest influence. The pictures of Brouwer, Teniers, and Ostade, though high works of art, are real caricatures of peasant life.

The invention of the printing press gave to caricature a new power, but it was hindered from using this power by the lack of freedom of the press. In France, each party made use of caricature during the wars of the Reformation, and the well-known "Songes Drôlatiques," attributed to Rabelais, ridiculed both parties. A really great caricaturist of the seventeenth century was Callot, but he devoted himself to satirizing general types. In his famous prints, the "Miseries of War," he may be said to have founded the modern school of ironical genre. Under Louis XIII and his successor, caricature was active, especially at the close of the reign of Louis XIV, who was much annoyed by the Dutch artist Romain de Hoghe, a pupil of Callot, in the service of William of Orange. The caricaturists lashed, with a merciless hand, the immoralities of Louis XV, and the clerical régime. During the Revolution caricature became a means of political propaganda and was especially used by the Republicans. Each event of the Revolution was lauded or attacked, the King and Queen being especially noticed. Napoleon I confined caricature to manners and customs, but the English lampooned him all the more for the repression in France. After the Restoration the returned aristocracy and the clerical tendencies of the kings formed excellent butts of ridicule, even such artists as Delacroix and Decamps taking part. The Revolution of 1830 brought greater liberty of the press and, aided by the invention of lithography, caricature flourished as never before. In that year Charles Philippon founded *La Caricature*, which was followed by *Charivari* and the *Journal pour Rire*. Louis Philippe was the most caricatured of all French monarchs, his pear-shaped head forming a peculiarly tempting butt of ridicule. A brilliant group of caricaturists arose, who were of great importance in the history of art and did much to bring art back from classicism to real life. Honoré Daumier, in particular, lashed the Chamber of Deputies, the peers, and the kings, as he afterward ridiculed Napoleon III. Among other artists were Carle Vernet, Gavarni, Henri Monnier, and Cham, probably the most important group of caricaturists the world has seen. Under Napoleon political caricature was confined to external politics, but the third republic brought liberty and saw the development of such talents as Grévin, Wilette, Caran d'Ache, Pille, Boutet de Monvel, Forsain, Hermann Paul, and others.

In England both Puritan and Cavalier made frequent use of caricature in their great struggle, but the artists were mainly foreign, especially Dutch. For under the free government of Holland political caricature flourished in the seventeenth and early eighteenth centuries as nowhere else in Europe. The first great English caricaturist was Hogarth (1697-1764), who satirized social vice with realism and force. Political caricature was rife with the ministry of Walpole in 1721, but the artists were mainly foreign. In the latter half of the century an important group of native artists arose, chief among whom were James Gillray and Thomas Rowlandson. They reflected political sentiments in the minutest manner, and are, in fact, a valuable source of history for the period. Their work is, however, rather coarse, in comparison with that of the present. Chief among the artists of the early half of the nineteenth century were George Cruikshank, for "moral comedies," and the brothers John and Richard Doyle for political caricature. In 1841 was founded *Punch, or the London Charivari*, in which the more refined modern caricature of Leech and Tenniel flourished. The most important of its contributors was Du Maurier, the refined portrayer of English aristocratic society. Mention should also be made of Phil May and of Harry Furniss, E. D. Reed, and Sir F. C. Gould among more recent cartoonists.

In Germany political caricature began with the Congress of Vienna, but was restrained by the lack of freedom of the press. The *Fliegende Blätter*, a humorous but nonpolitical journal, was founded in Munich in 1844. It employed such artists as Harburger, Oberländer, and Megendorfer, and the standard of work in its pages is very high. With the Revolution of 1848 the Berlin *Kladderadatsch* began its activity, and soon became famous by its political caricatures. Those on Bismarck, by Wilhelm Scholz, have become historic. The *Düsseldorfer Monatshefte* was carried on by artists of the Düsseldorf school. Vienna has a number of comic journals, chief among which are *Kikeriki* and the *Figaro*, for which Wilhelm Busch and Schliessmann have done good work. More recent publications are the *Jugend*, to which Thöny, Pankok, Dietz, Fidus, and Wilke are contributors, and *Simplicissimus*, both originally printed in Munich. On account of its extremely radical tendencies the latter is now published in Zurich. It is well known through the drawings of Paul, T. T. Heine, and Thöny. The principal comic publications of Berlin are the *Narrenschiff* ('Ship of Fools'), with Hans Baluschek as most important contributor, and *Lustige Blätter*.

The greatest Spanish caricaturist was Goya (1746-1828), whose masterly satirical talent, in both painting and print, was directed against the foibles and vices of society. Political caricature exists in nearly all European countries, and it has become a mighty force in politics. The American revolution called forth a host of caricatures in England and on the Continent, and in the Colonies the engravers Paul Revere and Benjamin Franklin, among others, published political cartoons. The War of 1812 gave occasion for the satirical prints of William Charles and Doolittle; but it was the Civil War that developed the full power of caricature in the United States, beginning with the Currier and Ives lithographs and culminating later in the brilliant series of cartoons in which Thomas

Nast satirized the Canal ring and the Tweed ring in New York. Nast's best work was done for *Harper's Weekly*, in which he was succeeded by Bush. *Puck*, the first comic weekly paper in the United States, was established in 1876 by Joseph Keppler, a German, who was its chief caricaturist. Its rival, *Judge*, was founded in 1877. Among their most important contributors were F. B. Oppen, Zimmerman, Gillam, Mortimer Flagg, and J. H. S. Smith. *Life*, devoted especially to social caricature, was established in 1883. Its most important contributor was Charles Dana Gibson, whose inimitable representations of American girlhood and womanhood and characterization of American society are world famous. Mention should also be made of Oliver Herford, James Swinnerton, and A. B. Frost. Of late years the daily newspapers have made increasing use of caricature. Supplements devoted to caricatures accompany the Sunday papers, and nearly all prominent journals issue daily political cartoons. Among recent American caricaturists are T. E. Powers, R. F. Outcault, Homer Davenport, John T. McCutcheon, Louis Dalrymple, Carl Schultze, Kate Carew, A. B. Frost, and C. Nelan.

Bibliography. The chief authority on caricature is Champfleury, *Histoire générale de la caricature* (5 vols., Paris, 1865-80), with supplementary volume in 1885. See also Wright, *History of Caricature and Grotesque in Literature and in Art* (London, 1875); Parton, *Caricature and Other Comic Art* (New York, 1887); Everitt, *English Caricaturists of the Nineteenth Century* (London, 1886); the works of Grand Carteret; Bayard, *La caricature et les caricaturistes* (Paris, 1900); Hermann, *Die deutsche Karikatur im neunzehnten Jahrhundert* (Bielefeld, 1901); Brinton, *The Eighteenth Century in English Caricature* (New York, 1905); Gould, *Political Caricatures, 1905* (London, 1905); Wright, *Art of Caricature* (New York, 1904); Maurice and Cooper, *History of the Nineteenth Century in Caricature* (New York, 1905). See also the articles on the principal caricaturists in the text.

CARIES, kă'ri-ēz (Lat., rottenness). A disease of bone analogous to the ulceration of soft tissues. It is characterized by a gradual loss of substance, suppuration occurring, and the bone breaking down and coming away in granular detritus. This finds its way to the surface, and an opening occurs through which the purulent fluid discharges. Caries may attack any bone, but it usually selects the vertebræ, bones of the wrist and foot, and the articular ends of long bones. The ossicles of the middle ear and the temporal bone are often the seat of caries. In spinal caries the disintegrating process attacks the cartilaginous disks between the vertebræ as well as the bone. The various vertebræ yield under the weight of the trunk, and the spine curves forward or to one side. Frequently the pus and detritus find their way to a point in the groin, passing down between the sheaths of various muscles, before opening at the surface and discharging. When caries attacks the joint ends of bones, the part enlarges, the cartilages become affected, pus forms, and amputation of the limb or excision of the joint is frequently necessary to save the patient's life. The common causes of caries are injuries, infected wounds, tuberculosis, and syphilis. If affecting a small bone, the latter may be entirely removed; and if limited to articular extremities, these

may be excised. The extent and severity of the process may now be accurately determined by X-ray photographs. Constitutional treatment to improve assimilation and nutrition and combat any accompanying cachexia must be employed. See NECROSIS; POTT'S DISEASE.

Caries of the Teeth. This depends either on an original faulty formation of the substance of the teeth, or microbic infection, generally due to neglect. The carious portions should in all cases be removed, and replaced by gold, platinum, porcelain, or other filling. If the pulp be exposed and pain be present, the cavity may be filled with cotton wet with oil of cloves, tincture of capsicum, or a strong solution of cocaine, or chloroform, for temporary relief. Ten grains of tannin and five grains of gum mastic dissolved in a dram of ether, applied after the cavity is wiped dry, will often control pain for many hours.

CARIGARA, kă'rê-gă'rá. A town of Leyte, Philippines, 21 miles west-northwest of Tacloban (Map: Philippine Islands, E 5). It is situated on a bayou on the north coast of the island and is a landing place for steamers from Manila. Pop., 1903, 16,382.

CARIGNANO, kă'rê-nyă'nô. A city in the Province of Turin, north Italy, in a fertile but damp locality on the left bank of the Po, 11 miles south of Turin. The church of San Giovanni Battista is the work of Benedetto Alfieri. The church of Santa Maria delle Grazie contains a monument to Bianca Palæologus, wife of Duke Charles I of Savoy. After the death of Prince Ludovico of Acaia in 1418, Carignano fell to the dukes of Savoy and was given by Charles Emmanuel I as a principality to his youngest son Tommaso, who was an ancestor of the present King of Italy. The principal occupations of the people of Carignano are the culture and manufacture of silk. Pop., 1901 (commune), 7129; 1911, 7034.

CARILLIS. See CAGLIARI.

CARILLON, Fr. pron. kă'rê'yôn'. See CHIMES.

CARIMATA, kă'rê-mă'tá, or **KARIMATA**. A name applied to the strait between Borneo and Billiton in the Dutch East Indies; also to a cluster of isles in the same passage; and lastly to the principal member of the group, whose highest point, a peak of 2000 feet, is in lat. 1° 36' S. and long. 108° 54' E. (Map: East Indies, C 5).

CARINATÆ (Neo-Lat., nom. pl. of Lat. *carinatus*, keel-shaped, from *carina*, keel). One of the two great subclasses of living birds, the other being *Ratitæ*, distinguished by the presence of a more or less well-developed "keel" on the sternum. Associated with this character is the condition of the wings, which are well formed and almost always fitted for flight. The *Carinatæ* include more than 14,000 known species of birds. See *BRD*.

CARINI, kă-rê'nê. A city in the Province of Palermo, Sicily, situated on a steep hill, 4 miles from the sea, in a country rich in corn and wine, 17 miles west of Palermo (Map: Italy, H 9). The castle was built by the Chiaramonti, in the fourteenth century. In the vicinity are caves in which animal fossils are found. The Sicilian Revolutionists were defeated here, April 18, 1860, by the Bourbon troops. North of the town was the ancient Hyccara, from which the Athenians carried off the 12-year-old Laïs, who grew up to be so famous a courtesan. Pop.,

1881 (commune), 12,037; 1901, 13,931; 1911, 13,586.

CARINTHIA (Ger. *Kärnten*, from the Celtic tribe of *Carni*). A crownland and duchy of Austria-Hungary, bounded by Salzburg and Styria on the north, Styria on the east, Italy, Görz and Gradisca, and Carniola on the south, and Tirol on the west (Map: Austria, C 3). Its area is 3989 square miles.

Carinthia is a very mountainous country. Its northern part is traversed from west to east by a portion of the Hohe Tauern and the Styrian Alps, while its eastern end is covered by other Alpine ranges. South of the Drave rise the Carnic Alps and the Karawanken, a continuation of the former chain. In the interior there is the important valley of the Drave, which separates the two mountain systems of the north and south. There are a number of large and very attractive lakes; among them are the Wörther, Millstätter, and the Weissen. There are also some valuable mineral springs. The climate is not unlike that of Tirol, and cretinism is frequent.

Industries. Owing to its mountainous surface, only 14 per cent of the land of Carinthia is adapted for tillage, the larger part of the productive land being covered with forests or used for pasture. Large quantities of timber are floated down the Drave. Nearly all the surface of the country has been made remunerative. Rye, oats, wheat, buckwheat, and clover hay are leading crops. The raising of live stock is carried on extensively in the mountain ranges, and the horses of Carinthia are highly valued. The mountains are rich in minerals, especially lead, of which Carinthia is considered one of the chief producers in Europe. In 1910 there were mined 53,389 tons of iron, 18,368 tons of lead, 32,105 tons of zinc, and 132,143 tons of coal. The total value of the products of mine and forge amounted to \$2,014,600. The chief manufacturing industry is the production of iron and steel goods. Bessemer steel rails, wire, wire nails, and bar iron are produced in great quantities. Some machinery, firearms, textiles, leather goods, cement, and wood pulp are exported. Considering the configuration of its surface, Carinthia is well provided with roads; also waterways, among which the most important is the Drave. Klagenfurt is the centre of the railway lines, of which there are about 385 miles, or 1.01 per cent of the total mileage of Austria.

Government. The Diet of Carinthia consists of 37 members, consisting of the Prince-Bishop of Gurk, 10 representatives of the landed aristocracy, 9 representatives of the towns, 3 representatives of the chambers of commerce and industry of Klagenfurt, and 14 representatives of the rural communities. In the Lower House of the Austrian Reichsrat Carinthia is represented by 9 members. For administrative purposes, Carinthia is divided into 7 counties and the city of Klagenfurt. There are nearly 400 elementary schools, with a total attendance of about 60,000, constituting over 91 per cent of the total school population.

The population of Carinthia in 1900 was 367,344. In 1910 it was 396,200. About 72 per cent of the people are Germans, and 28 per cent Slovenes near the Carniola border. Ninety-five per cent belong to the Roman Catholic church, while the remainder are Protestants. The capital, Klagenfurt (q.v.), has a population, 1910, of 24,284.

History. Under the Roman Empire Carinthia formed part of the Province of Noricum. Its ancient inhabitants were the Carni, a Celtic people, who during the period of the migrations were overwhelmed by a race of Slavs. The Kingdom of Carantania, which the invaders founded under the leadership of Samo, an energetic Frank, proved of short duration, and the region was annexed by Charlemagne to the Frankish Empire. In 843 it passed to Louis the German, and was ruled for 500 years by dukes of different lines, until it came into the possession of the archdukes of Austria in 1335. Upper Carinthia was held by the French from 1809 to 1813.

Consult: Ankershofen, *Geschichte des Herzogtums Kärnten* (Klagenfurt, 1850); Schlechter, *Alte Geschichte des Obergailthales in Kärnten* (Vienna, 1885); *Kärnten und Krain* (ib., 1891); Aelschker, *Geschichte Kärntens* (Klagenfurt, 1885).

CARINUS, MARCUS AURELIUS (?-285). Emperor of Rome from 283 to 284, son of the Emperor Carus. Made Cæsar (heir presumptive) in 282, with his brother, Numerianus, he was associated in the Empire in August, 283, and reigned alone after the murder of his father. When Diocletian seized the chief power in Mæsia, Carinus marched against him, but was killed by his own soldiers.

CARIPE, kâ-rê-pâ. A town of Venezuela, situated in a fertile valley of the same name, 50 miles southeast of Cumaná. It contains an old church formerly belonging to the Capuchin monastery, since ruined. The valley is noted for a cavern (2800 feet from front to back and from 70 to 80 feet high) inhabited by the remarkable bird called guacharo (q.v.), from which it received its name: Cueva del Guácharo. Pop. of town and valley, about 5000.

CARIRI, kâ-rê-rê', or KIRIBI. A former powerful tribe residing on São Francisco River, in the Province of Bahia, eastern Brazil. They were "Christianized" in 1650, and, at the end of the century, were recorded as living in the region of Cochoeira (modern Caranquejo and Villa da Pedra Branca) and in the old missions of Canabrava, Saco, Natuva, and Yuru. With the Cariri belonged the Sabujá to the south. They were one of the most progressive of the Brazilian tribes, cultivating the ground and excelling in weaving. In 1699 the Jesuit Mamiani published a grammar of their language, which constitutes a distinct stock. They are now reduced to less than 500 souls dwelling in the valley of the lower São Francisco. Consult Adam, *Matériaux pour servir à l'établissement d'un grammaire comparé des dialectes de la famille Kariri* (Paris, 1897), and Chamberlain, in *Science*, N. S., vol. xxxvii, p. 344 (1913).

CARISBROOKE, kâr'is-bruk. A village in the Isle of Wight, adjoining Newport (Map: England, E 6), which was formerly the "new port" of Carisbrooke. It is chiefly noted for its castle, which is supposed to have been built by the Saxons. It was enlarged in the eleventh century by the first Lord of Wight, was captured by Stephen in 1136, and in the time of Richard II successfully resisted attacks by the French. During the reign of Elizabeth it was enlarged and the present outer works added. It was in this castle that Charles I took refuge in November, 1647, and was imprisoned for 14 months. After his execution his two youngest children were confined in the castle, and Princess Elizabeth died there, 19 months later. The re-

mains of the castle are still extensive. Near by are the ruins of a Cistercian priory founded in the twelfth century and vestiges of a Roman villa. The population of Carisbrooke is about 8300. Consult Beattie, "Carisbrooke Castle and its Ancient Lords," in *British Archaeological Journal*, vol. x (London, 1855).

CARISSIMI, ká-rés-sé-mě, GIACOMO (c.1604-74). An Italian church composer. He was born at Marino, where he acquired his first knowledge of music. In 1624-28 he was kapellmeister at Assisi, and from that time until his death at the church of St. Apollinaris in Rome. His works mark a turning point from the polyphonic style of the Palestrina school to the monodic style of the founders of opera. In his search for expression he produced a freer recitative that fitted the accents of ordinary speech, and he gave prominence to the instrumental accompaniment. He was the creator of the chamber cantata and added an instrumental accompaniment to the motet. His style is more animated and graceful than that of his predecessors. His numerous compositions included cantatas, oratorios, masses, motets, and even music of a comic character. The greater part of them has perished, but enough has been preserved in various libraries (chiefly in manuscript) to entitle Carissimi to a rank among the most important figures in the history of the oratorio. Among his published works were the following: "Jephthah," "Judicium Salomonis," "Baltazar," "Jonas," in vol. ii of Chrysander's *Denkmäler der Tonkunst* (1856); motets (1664 and 1667); masses (1663 and 1667); *Arie da camera* (1667); and *Ars Cantandi* (3d ed., 1696). As a teacher Carissimi was greatly esteemed, Alessandro Scarlatti, Buononcini, Cesti, Kerll, Krieger, and Charpentier being the most noted of his pupils.

CARITAT. See CONDORETT.

CARL, PHILIPP (1837-91). A German astronomer and physicist, born at Neustadt, Middle Franconia. He studied the exact sciences in Munich and spent several years in astrophysical researches at the observatory of that city. In 1865 he established, and for several years thereafter directed, a workshop for the manufacture of mathematical instruments. In that year he established also the *Repertorium für Experimentalphysik*, which he edited until 1882. His published works include: *Die Principien der astronomischen Instrumentenkunde* (1863) and *Repertorium der Kometastronomie* (1864).

CARL, WILLIAM CRANE (1865-). An American organist, born at Bloomfield, N. J. He studied music under Samuel P. Warren and Madeline Schiller in New York, and under Alexandre Guilmant in Paris. He made several organ tours in Europe and the United States and one to Alaska. For five seasons he was director of the Baton Club and for two seasons of the Gamut Club. He became director of the Guilmant Organ School of New York, and also organist and musical director of the Old First Presbyterian Church, where he frequently gave organ recitals. His publications include: *Several Songs and Organ Arrangements* (1892); *Masterpieces for the Organ* (1898); *Thirty Postludes for the Organ* (1900).

CARLÉN, kár-lán', EMILIA SMITH FLYGARE (1807-92). A Swedish novelist, noted for her stories of seafaring folk, fishermen, and smugglers, with whom as a child she had come in frequent contact, through the trading voyages

of her father, Rutger Smith. She was born at Strömstad and married, at the age of 20, the physician A. Flygare. After his death, in 1833, she decided to devote herself to literature. Her first novel, *Waldemar Klein* (1838), was followed by her marriage (1841) to Johan Gabriel Carlén, a lawyer and poet of Stockholm. Popular tales followed in rapid succession until 1852, when she lost a son and wrote no more until 1858. With her husband's death in 1875 her literary activity ceased altogether, although until that time her salon had been the literary centre of the capital. She founded charitable endowments in aid of students and of teachers, and of fishermen and their widows. Of her works (30 vols.), many are translated into German, French, and English. Characteristic are *Gustav Lindorm* (1839), *The Rose of Tistelön* (1842), and *The Maiden's Tower* (1848), all translated into English. She wrote, also, a bright autobiography, *Reminiscences of Swedish Literary Life* (1878). Consult Svanberg, E. F. *Carlén; en studie* (Stockholm, 1912), and Schoeldestroem, E. F. *Carlén* (ib., 1888).

CARLES, kár'lás, or **CARLOS**. A town of Panay, Philippines, District of Concepción, Province of Iloilo, situated at the northeast extremity of the island, 25 miles north of Concepción. Pop., 1903, 6676.

CARLETON, kár'l-ton, BUCK G. (1856-1914). An American surgeon, born at Whitefield, N. H. He was educated at the New York Homœopathic Medical College and in the medical department of the University of the City of New York. In 1876 he joined the house staff, was pathologist in 1877, visiting physician in 1881, and genito-urinary surgeon in 1895 at the Homœopathic and Metropolitan hospitals. In addition he served as demonstrator in anatomy in 1879-80, adjunct professor of anatomy in 1880-82, professor of genito-urinary surgery in 1902-10, and of medical ethics and clinical urology after 1910, in the New York Homœopathic Medical College. His publications include: *Genito-Urinary and Venereal Diseases* (1895); *Medical and Surgical Diseases of the Kidneys and Ureters* (1898); *Sexual Disorders of Men* (2d ed., 1899); *Uropoietic Diseases* (3d ed., 1902); *Classified Index of Homœopathic Materia Medica for Urogenital Diseases* (1903); *Urological and Venereal Diseases* (1905).

CARLETON, kár'l-ton, SIR GUY, first LORD DORCHESTER (1724-1808). A British soldier and administrator, born in county Tyrone, Ireland. He served at Louisbourg, Quebec, and Belle Isle, and was wounded in the siege of Havana in 1762. In 1766 he was appointed Lieutenant Governor, and in 1775 Governor of Quebec. Soon afterward he took command of the British forces in Canada, repelled the attack of Montgomery and Benedict Arnold in 1775-76, defeated Arnold on Lake Champlain, and captured Crown Point (1776). For these services he was made Knight of the Bath and lieutenant general. In 1777 he was superseded by Burgoyne. In 1782 he succeeded Sir Henry Clinton as commander in chief in America. Carleton remained in New York until the treaty of peace had been signed. On his return home he was granted a pension of £1000 a year and was created Baron Dorchester. In 1786 he again became Governor of Quebec and was very popular as an administrator of that province. He objected to the division (1791) into the provinces of Upper and Lower Canada. He returned to

England in 1796. See the biography by A. G. Bradley in *Makers of Canada Series*.

CARLETON, HENRY GUY (1856-1910). An American journalist and dramatist. He is best known as a playwright, and among his principal dramas are *The Pembertons* (1889), *Victor Durand* (1885), *The Gilded Fool* (1892), and *Ambition* (1896). His tragedy *Memnon* (1881; never produced) is a play of great strength and contains many lines of exceptional beauty.

CARLETON, JAMES HENRY (1814-73). An American soldier, born in Maine. He was a volunteer in the Aroostook War over the disputed northeastern frontier of the United States (1838-39); then entered the regular army; was with Kearny's expedition to the Rocky Mountains (1846), and served on the staff of General Wool in Mexico, distinguishing himself at Buena Vista, where he was brevetted major. He was the organizer and commander of the "California Column" of troops, which in the spring of 1862 undertook the march across the Yuma and Gila deserts to the Rio Grande. In April of that year he was commissioned brigadier general of volunteers, with orders to relieve General Canby as commander of the Department of New Mexico. In recognition of his services there, he was at the close of the war raised by brevet through all ranks in the regular army up to that of major general. He wrote *The Battle of Buena Vista, with the Operations of the Army of Occupation for One Month* (1848).

CARLETON, MARK ALFRED (1866-). An American cerealist, born at Jerusalem, Ohio, and educated at the Kansas Agricultural College. He became cerealist in the United States Department of Agriculture in 1894, conducted agricultural investigations for the United States in Russia and Siberia in 1898-99, and introduced several new cereal grain crops from abroad, including the durum wheat. This grain rapidly displaced the soft spring wheat varieties, especially in Nebraska, Kansas, Oklahoma, and Texas, and soon reached an annual yield valued at \$40,000,000. Carleton was chairman of the jury of awards at the St. Louis Exposition in 1904. His publications include the following bulletins of the United States Department of Agriculture: *Cereal Rusts of the United States* (1899); *The Basis for the Improvement of American Wheats* (1900); *The Commercial Status of Durum Wheat* (1904); *Barley Culture* (1908); *Ten Years' Experience with Swedish Select Oat* (1910); *Winter Emmer* (1911).

CARLETON, WILL (1845-1912). An American poet, noted for his ballads of domestic life, which have been very popular. He was born at Hudson, Mich., Oct. 21, 1845. Soon after his graduation at Hillsdale, in 1869, he traveled widely as a lecturer in the Northern and Western States, Great Britain, and Canada. His first *Poems* appeared in 1871. These were followed by *Farm Ballads* (1873); *Farm Legends* (1876); *Young Folk's Centennial Rhymes* (1876); *Farm Festivals* (1881); *City Ballads* (1885); *City Festivals* (1892); *Rhymes of our Planet* (1895); *Songs of Two Centuries* (1902); *Poems for Young Americans* (1906); *Drifted In* (1908); *A Thousand Thoughts* (1908). He was also for a time editor of *Everywhere*, an illustrated magazine.

CARLETON, WILLIAM (1798-1869). The best of Irish novelists of Irish life, born at Prillisk, Ireland. Bred and educated, or half educated, among the peasantry, he passed

through the common sufferings and privations of Irish poverty. After receiving some scanty instruction in hedge schools, a longing to see the world seized him, and he made his way to Dublin, where he continued the necessitous life from which to the end of his days he escaped only at intervals. He soon began writing, for a Dublin periodical, sketches of Irish life, wonderful in their faithful presentation of the manners and customs, the tricky humor, the tragedies, and the pure and delicate sentiment of the class from which he sprung. Some of these he published in 1830, under the title of *Traits and Stories of the Irish Peasantry*. The book pleased the public and won the favor of critics. The year 1833 saw the publication of a second series of the *Traits and Stories*, which was also well received. In 1839 he published *Fardarougha, the Miser*, his first attempt at a long novel of Irish manners. This was followed by a volume of *Tales* (1841), predominantly tragic or pathetic. In 1845 appeared *Valentine M'Clutchy*, a powerful novel attacking that prime curse of Irish life, the middleman, and showing up the bigotries and barbarities of the worst of the Orangemen. Other narratives, notably *Roddy, the Rover* (1845), *The Black Prophet* (1847), and *The Tithe Proctor* (1849), contain ample evidence of the author's gifts as a novelist—his sustained narrative interest and his rare faculty for making vivid, realistic transcripts of Ireland as he knew it. His *Willie Reilly* was published in 1855, and the *Evil Eye* in 1860. Carleton is, before all others, the historian in fiction of the Celtic-Irish people. Sharing their qualities of mind and temperament and their peculiar defects, he had genuine sympathy with all their joys and sorrows, and the graphic pen to describe them. Carleton's stories are still fresh and absorbing, and his work is less read and known than it deserves to be. D. J. O'Donoghue's *Life of Carleton* (1896) contains, besides the biography, a full bibliography. The best edition of *Traits and Stories* is that of O'Donoghue (New York and London, 1896). American and English editions of most of his works are still in print. Consult *Representative Irish Tales* (New York and London, 1894), ed. by W. B. Yeats; and H. S. Krans, *Irish Life in Irish Fiction* (New York and London, 1903), which includes a critical estimate and a bibliography.

CARLETON COLLEGE. An undenominational institution of higher learning, founded in 1866 at Northfield, Minn., under the auspices of the Congregational denomination. It received its name from William Carleton, of Charlestown, Mass., who gave it \$50,000. The campus and grounds of the college include over 120 acres, and its property is valued at about \$600,000. It has well-equipped chemical, physical, and biological laboratories and an efficient astronomical department. The endowment of the college in 1913 amounted to over a million dollars. The library contained in that year about 30,000 volumes. The college faculty numbered 30 and the conservatory faculty 4. In the regular college department were 398 students and in the conservatory of music 27. The president is Donald J. Cowling, D.D.

CARLETON PLACE. A town in Lanark Co., Ontario, Canada, on the (Canadian) Mississippi River and the Canadian Pacific Railroad, 28 miles southwest of Ottawa (Map: Ontario, H 2). Carleton Place is a division point of the

Canadian Pacific, with railway shops, and manufactures foundry products, woolen goods, launches, and lumber products. Pop., 1901, 4059; 1911, 4435.

CARLI, kār-lē, or **CARLI-RUBBI**, GIOVANNI RINALDO, COUNT (1720-95). An Italian economist and antiquarian, born at Capo d'Istria. In 1743 the Senate of Venice appointed him professor of astronomy and navigation there. In 1753 he was appointed president of the newly established Council of Commerce in Milan. Soon afterward he published the first volume of his celebrated work on the coins of Italy, under the title *Delle monete e dell' istituzione delle zeche d'Italia* (3 vols., 1754-60). He wrote a pamphlet favoring a protective tariff, and a work entitled *Delle antichità italiane* (5 vols., 1788-91). His complete works appeared in 18 vols. (1784-94).

CARLILE, RICHARD (1790-1843). An English freethinker, born at Ashburton. He was apprentice in a chemist's shop, worked as a journeyman tinman, and, through the reading of Paine's *Rights of Man*, became a Radical. He peddled in London a weekly called the *Black Dwarf*, printed and disposed of 25,000 copies of Southey's *Wat Tyler*, reprinted the *Parodies* of William Horne, and wrote, in imitation of them, *The Political Litany* (1817); for this he spent 18 weeks in the King's Bench Prison. For publishing Paine's works (1818) and others of like character, in 1819 he was condemned to pay £1500 and was imprisoned in Dorchester jail for three years. Here he published the first 12 volumes of his periodical, *The Republican* (1819-26). A public subscription of £6000 was raised for the prosecution of his assistants, and his imprisonment was increased by three years, in lieu of the fines. Upon his release he edited a weekly, *The Gorgon*, and conducted public discussions in the Rotunda, Blackfriars Road. Subsequently he suffered something more than three years of additional imprisonment for not paying church rates. He did more than any other Englishman of his time for the freedom of the press.

CARLIN (probably dim. of *carl*, AS. *carl*, Icel. OHG. *karl*, Ger. *Karl*, fellow, Eng. *churl*, otherwise explained as a corruption of Fr. *harlequin*. It. *arlequino*, harlequin). An inferior variety of pug dog. See PUG.

CARLINES, or **CARLINGS** (Fr. *carlingue*, Russ. *karlinskā*). In shipbuilding, small beams laid fore and aft and resting upon the main or deck beams. These, with other pieces called *ledges*, laid at right angles to them, form a framework by which the deck is supported.

CARLING, SIR JOHN (1828-1911). A Canadian capitalist and statesman. He was born in Middlesex Co., Ontario, was educated at the local schools, and removed to London (Ontario) in 1839. At an early age he joined his father in the brewing and malting business, and also was interested in municipal politics and educational affairs, serving as school trustee and alderman. In 1857 he was elected Conservative member for London in the Legislative Assembly of Canada. After Confederation in 1867, he represented London in both the House of Commons and the Ontario Legislature, resigning his seat in the latter in 1872 when dual representation was abolished. In the Cartier-Macdonald government he was Receiver-General in 1862, and in the first Ontario government, of which John Sandfield Macdonald (q.v.) was Premier,

Carling was in 1867-71 Commissioner of Agriculture and Public Works. In the Dominion administration of Sir John A. Macdonald he was Postmaster-General from 1882 to 1885, when he was appointed Minister of Agriculture. This office he held until Macdonald's death in 1891, during the administration of Sir J. J. C. Abbott (q.v.), and also during, part of the administration of Sir John D. S. Thompson (q.v.). Carling was appointed to the Senate in 1891, but resigned in 1892, and was reappointed in 1896. In 1893 he was knighted. As Commissioner of Agriculture in 1867-71 he was largely instrumental in establishing provincial government instruction in and aid to agriculture, and later, as Dominion Minister of Agriculture, in establishing the system of government experimental farms for Canada.

CARLINGFORD, CHICHESTER SAMUEL FOR-
TESCUE, BARON (1823-98). A British statesman, born in county Louth, Ireland. He graduated at Christ Church, Oxford, and from 1847 to 1874 sat in Parliament for county Louth. He became a member of the Privy Council in 1864, and Chief Secretary for Ireland, succeeding Sir Robert Peel in 1865. This secretaryship he held again in 1868-70 under Gladstone, and in the preparation of the Land Bill of 1870 he rendered invaluable assistance. He became President of the Board of Trade in 1871, Lord Privy Seal in 1881, and in 1883 President of the Council. He rejected the Home Rule cause in 1886 and was thenceforth a Liberal Unionist. Many of Edward Lear's amusing letters were addressed to him. Consult Lady Strachey, *Lear's Letters* (2 vols., London, 1907, 1911).

CARLINI, kār-lē'nē, FRANCESCO (1783-1862). An Italian astronomer, born in Milan. He devoted himself to the study of astronomy and during the last 30 years of his life acted as director of the astronomical observatory of Milan, the *Ephemerides* of which he edited. On Mont Blanc in 1821 he made valuable studies of the attraction of mountain masses. His published works include *Esposizione di un nuovo metodo di costruire de tavole astronomiche applicato alle tavole del sole* (1810) and *Nuove tavole dei moti apparenti del sole* (1832).

CARLINVILLE. A city and the county seat of Macoupin Co., Ill., 60 miles north by east of St. Louis, Mo., on the Chicago and Alton and the Illinois Traction railroads (Map: Illinois, B 4). It is the seat of Blackburn University (Presbyterian), opened in 1859, and contains a fine county courthouse. The city is an important centre for local trade, has coal-mining interests, and in the vicinity are oil and natural-gas wells. Settled in 1833, Carlinville was incorporated in 1865. The government is administered by a mayor, elected biennially, and a municipal council. Pop., 1890, 3293; 1900, 3502; 1910, 3616.

CARLI-RUBBI. See CARLI.

CARLISLE, kār-lī' (Brit. *Caer Luel*, from *caer*, city, and *Luel*, connected with Irish *Lug*, name of a god, OHG. *lochōn*, to lure, Lett. *lūgt*, to pray; cf. the Lat. form, probably a translation, *Luguvallum*). A parliamentary and municipal borough and an episcopal city, the capital of the County of Cumberland, England, 7 miles from Solway Firth, 300 miles north-northwest of London, 101 miles south of Edinburgh, and 60 miles west-southwest of Newcastle (Map: England, D 2). It is situated on an eminence, on the south bank of the river Eden, 8 miles

above its mouth in the Solway Firth, at its confluence with the Caldew and the Petteril. The cathedral, a red freestone structure, was founded by William Rufus, and dedicated in 1101 by Henry I; in 1133 it was made the cathedral church of the newly formed diocese. A great part of the original Norman building was destroyed by fire in 1292. Two-thirds of the fine Norman nave, originally 141 feet long, were destroyed by Cromwell; the portion that was left has long been used as a parish church. The choir is one of the finest in England, 138 feet long and 72 feet high, and consists of eight pointed arches. The east window, consisting of nine lights, is considered the finest decorated window in England. The castle was founded in 1092 and is now used as barracks; the remains of the keep form a massive lofty tower, with a very deep well. Mary, Queen of Scots, was confined in the castle after the battle of Langside. In spite of its antiquity, Carlisle is a thoroughly modern town in its appearance and facilities. Many fine new streets and buildings have been recently constructed, and the city has gradually come into possession of all the quasi-public works. It owns its water and gas works, and since 1899 has operated an electric light plant. Its markets and slaughterhouses are a profitable source of municipal revenue, and it maintains a library, a museum, and technical schools. It sends one member to Parliament, and the municipal borough is governed by a mayor, 10 aldermen, and 31 councillors. Seven railway lines enter Carlisle, which is connected by rail with the port of Silloth, 20 miles distant, where an extensive dock has been constructed on the Solway. The chief industries are the manufacture of cottons and calicoes, ironworks, tanneries, and dyeing establishments. The salmon fishing in the Eden is also of some importance. The United States has a resident consular agent. Pop., 1851, 26,310; 1891, 39,200; 1901, 45,480; 1911, 46,420. Carlisle was a Roman station, under the name of *Luguvallum*. It was the seat of the ancient kings of Cumbria and bore the British name of *Caer Luel*. It was frequently ravaged by the Picts and Scots, and about 875 it was destroyed by the Danes, after which it remained desolate for 200 years. Thence, to the union of England and Scotland, it was closely connected with the border wars and underwent many sieges. During the Civil War it declared for King Charles and suffered severely at the hands of the Parliamentarians. Carlisle, in 1745, surrendered to the Pretender. The Duke of Cumberland afterward took the city and punished the leaders with death. The Carlisle tables of mortality, based on the deaths which occurred in Carlisle, 1779-87, were drawn up by Dr. Heysham and have been ever since much used as a basis for life-insurance policies.

Consult: Creighton, *Carlisle* (London, 1889); Freeman, "Carlisle in English History," in *Archæological Journal*, vol. xxxix (ib., 1882); Marks, "Public Works in Carlisle," in *The Surveyor*, vol. xvii (ib., 1900); *Victoria History of Cumberland* (2 vols., ib., 1901-05).

CARLISLE. A borough and the county seat of Cumberland Co., Pa., 18 miles west-southwest of Harrisburg, on the Cumberland Valley and the Philadelphia and Reading railroads (Map: Pennsylvania, D 3). It is in a highly productive agricultural region, is well built, with broad streets, and has several fine public buildings. It is the seat of Dickinson College (nonsec-

tarian) (q.v.), of the United States Indian Training and Industrial School, and of the Metzger Institute for Girls, now part of Dickinson College. The industries include machine shops, chain and frog-switch works, axle factory, cotton-weaving and silk-throwster mills, body and gear works, ribbon mills, shoe factories, flour mills, hosiery, paper-box and carpet factories, etc. Mount Holly Springs, in the mountains just outside the city, is a popular summer resort. The government, as authorized by a general borough law of 1851, revised the following year, is administered by a Burgess, elected for three years, and a borough council. Carlisle was laid out and settled in 1751; in 1794, during the Whisky Rebellion, the Pennsylvania and New Jersey troops assembled here; and on July 1, 1863, the borough was shelled by the Confederates. Pop., 1900, 9626; 1910, 10,303; 1920, 10,916. Consult Wing, *History of Cumberland County, Pa.* (Philadelphia, 1879) and *History of Cumberland and Adams Counties, Pa.* (Chicago, 1886).

CARLISLE, GEORGE WILLIAM FREDERICK HOWARD, seventh EARL OF (1802-84). An English statesman and author. He was born in London, April 18, 1802. The eldest son of the sixth Earl, he bore the courtesy title of Lord Morpeth. He was educated at Eton and at Christ Church, Oxford, where, in 1821, he won the Chancellor's and the Newdigate prizes with a Latin and an English poem. In 1826 he was attaché to his uncle, the Duke of Devonshire, in Russia; while abroad he was elected to Parliament as a Whig, and on his return supported the repeal of the Catholic disabilities in his maiden speech on March 5, 1827. In 1830 he was elected representative for Yorkshire, and, after the Reform Bill, for the West Riding. Under Lord Melbourne, he was Chief Secretary for Ireland (1835-41), and his impartial distribution of patronage made him popular in Dublin. Rejected in 1841 by the West Riding, he was reelected in 1846, and remained one of its representatives until his father's death (1848) seated him in the House of Lords. Under Lord John Russell's ministry (1846-52), he was Chief Commissioner of Woods and Forests and afterward Chancellor of the Duchy of Lancaster. When Lord Palmerston was made Prime Minister in 1855, Carlisle was appointed Lord Lieutenant of Ireland, a post which he held until the advent of the Earl of Derby's government in 1858. He succeeded to the same office again when Lord Palmerston was reinstated in 1859. In 1841-42 he traveled in the United States and Canada and on his return described his visit in a series of popular lectures. He obtained fame as a literary man by these lectures and by another, *The Life and Writings of Pope* (1851). He published a tragedy, *The Last of the Greeks* (1828); *A Diary in Turkish and Greek Waters* (1854); and a volume of *Poems* was issued after his death. He died at Castle Howard, Dec. 5, 1864. His *Viceroyal Speeches*, ed. by J. Gaskin, appeared in 1866.

CARLISLE, JOHN GRIFFIN (1835-1910). An American lawyer and politician. He was born in Kentucky, received a common-school education, taught school, was admitted to the bar in 1858. In State politics he took a prominent part, serving as Democratic member of the Kentucky House of Representatives (1859-63), as State Senator (1868-71), and as Lieutenant Governor (1871-75), and from 1876 to 1890

he was a member of the National House of Representatives, being Speaker from 1883 to 1889. As Speaker, he showed himself an able parliamentarian and greatly extended the use of the Speaker's power of "recognition." In 1890 he was elected United States Senator. He advocated revenue reform, but favored only an approximation to the free-trade standard. He was Secretary of the Treasury during President Cleveland's second administration (1893-97), and afterward settled in New York to resume the practice of law. In 1896 he opposed Bryan and made able "sound money" speeches. He was prominent among the opponents of Imperialism.

CARLISLE COLLEGE. See INDIAN INDUSTRIAL AND TRAINING SCHOOL.

CARLISTS. The supporters of Don Carlos and his descendants in their pretensions to the Spanish crown after the death of Ferdinand VII. Their opponents who supported the Queen Regent Christina (see **MARÍA CRISTINA**) and her daughter Isabel II were known as Cristinos and Isabelinos. See **CARLOS, DON**.

CARLOMAN, or KARLMANN (751-71). A king of the Franks, younger brother of Charlemagne. He was anointed in 754 by Pope Stephen III, with Charlemagne, and at the division of territory between himself and Charlemagne in 768 received Burgundy, Alsace, Provence, Alemannia, and southeastern Aquitaine, being crowned in the same year at Soissons. See **CHARLES THE GREAT**.

CARLOS, kár'los, DON (1545-68). The son of Philip II and his first wife, María de Portugal. He was born July 8, 1545, at Valladolid. For a long while it was thought that he would be dumb, as he could not pronounce a word before he was five years of age. He was weak of constitution and physically malformed; and in addition was of unsound intellect and of a temper both vicious and untrustworthy. Opinions have differed considerably concerning the character of Don Carlos, but recent historical research has proved that he was afflicted with hereditary insanity, which was advanced to a much more violent state by his accident in falling down stairs in 1562 and fracturing his skull. His viciousness reached a climax with his disappointment at not being permitted to accompany the Duke of Alba to the Netherlands. His attempt to stab the Duke, when the latter was taking leave of him, estranged his father. The Prince's conduct grew rapidly worse. At Christmas, 1567, he talked wildly, to his half uncle Don Juan, of escaping from Spain and killing a man with whom he had quarreled. In the confessional it was discovered that he meant his father. Philip was informed and had the Prince closely watched. In the middle of January, 1568, he made preparations for his escape, and, thinking Don Juan had betrayed him, he tried to kill him. That same night (January 18) Philip himself in full armor entered his son's room with guards and placed him under arrest. From that time the Prince was kept in close confinement, and for months some sort of trial or examination dragged on. It was rumored by Philip's enemies that Carlos was to be sacrificed for heresy by the Inquisition; but there is no evidence that such was the case. The Prince's madness grew rapidly worse. He attempted to kill himself in various ways. For long periods he fasted and then suddenly would eat and drink like a glutton. The French ambassador understood the situation and wrote, on

July 21, 1568, that the Prince was dying of weakness. "The King is much grieved," says the ambassador, "because if he die the world will talk." The next day the Prince died. Philip's enemies, and especially the traitor Antonio Pérez, asserted that he had been killed at the King's own orders. Authorities are now agreed that the balance of evidence shows that he died as a result of his own maniacal practices.

The traditional romantic story is preserved in works by Lord John Russell and M. J. Chénier, and in the following: C. V. de Saint-Réal, *Don Carlos, nouvelle historique* (Paris, 1672); Schiller, *Don Carlos*; Alfieri, *Philip the Second*; J. G. de Campistron, *Andronic*; Thomas Otway, *Don Carlos, Prince of Spain*; Núñez de Arce, *Haz de Leña*. For a discussion of plays on this same subject, by Ximénez de Enciso and Juan Pérez de Montalván, consult G. W. Bacon, "The Life and Dramatic Works of Doctor Juan Pérez de Montalván" (1602-38), in *Revue Hispanique*, vol. xxvi, pp. 1-474 (1912). This traditional story was challenged by Llorente, the Spanish historian of the Inquisition; but not until the appearance in 1867 of the researches of Louis P. Gachard (who had been sent to Spain in 1863 by the Belgian government) were the real facts made known. Consult: Ranke, in *Wiener Jahrbücher der Litteratur*, vol. xli (Vienna, 1829); L. P. Gachard, *Don Carlos et Philippe II* (Paris, 1867); Maurenbrecher, *Don Carlos* (Berlin, 1876); Prescott, *Philip II* (Boston, 1855); Hume, *Spain: Its Greatness and Decay, 1479-1788* (Cambridge, 1st ed., 1898; 2d ed., 1899; reprinted, 1905); Hume, *The Spanish People* (London, 1901).

CARLOS, DON. The name of several pretenders to the Spanish crown. **DON CARLOS MARÍA JOSÉ ISIDORO DE BORBÓN, COUNT OF MOLINA (1788-1855)**, was the second son of Charles IV of Spain and his wife Luisa María of Parma. He was educated chiefly by priests. After the expulsion of the French from Spain, his brother, Ferdinand VII, reascended the throne (1814), but as Ferdinand had married thrice without issue, Don Carlos hoped to succeed his brother. An insurrection in his interest broke out in 1823 in Catalonia, but was put down, Don Carlos himself not participating in it. Ferdinand, however, married for a fourth wife María Christina of Naples, who bore him a daughter, the Infanta María Isabella, Oct. 10, 1830. As the Salic Law, excluding females from the succession to the throne, had been abrogated on March 29 of the same year, the hopes of the Carlists were destroyed. During the illness of the King, in September, 1832, the Carlists succeeded in obtaining from him the reinstitution of the Salic Law; but this he revoked as soon as he had partially recovered. As Don Carlos still continued his protestations against its revocation, he was banished, in 1833, to Portugal, and soon afterward was commanded to reside in the Papal States. But before Carlos had embarked for Italy, King Ferdinand VII died, Sept. 29, 1833. Don Carlos was now recognized by his party as heir to the throne of Spain, and the usurper Dom Miguel of Portugal supported his claim. In 1834 a quadruple treaty was concluded between England, France, Spain, and Portugal, directed against Dom Miguel and Don Carlos, which resulted in the dethronement of Dom Miguel. In June, 1834, Don Carlos embarked for England. In the following month he

returned to the Continent, and passed in disguise through France into Spain, where he excited an insurrection in the northern provinces. The conflict raged till 1839, when the power of Don Carlos was broken by the surrender of General Maroto, and the pretender was compelled to escape into France. In 1834 he was deprived of his rights as infante by a royal decree, which was confirmed by the Cortes in 1837. In 1845 he abdicated in favor of his eldest son, and died at Trieste, March 10, 1855.—DON CARLOS LUIS FERNANDO DE BORBÓN, COUNT OF MONTEMOLÍN (1818–61), son of the preceding, succeeded to his claims and was recognized by the Carlists as Charles VI. In 1860 a Carlist insurrection was once more attempted, in which he was made a prisoner, and released only after signing a renunciation of his claims to the Spanish throne. As Charles VI died without issue (as did also his younger brother Ferdinand), his rights devolved upon his youngest brother, Don Juan, who had married the Archduchess Maria Beatrix of Austria, Princess of Modena. Their son, Don Carlos, was educated principally in Austria, and in 1867 married Margaret of Bourbon, Princess of Parma, after whose death, in 1893, he married Marie-Berthe, Princess of Rohan. In October, 1868, Don Juan, who because of his liberal views had never been popular with his party, abdicated in favor of his son, whose standard was raised by some of his partisans in the north of Spain in April, 1872.—DON CARLOS MARÍA DE LOS DOLORES JUAN ISIDORO JOSÉ FRANCISCO QUIRINO ANTONIO MIGUEL GABRIEL RAFAEL DE BORBÓN, DUKE OF MADRID (1848–1909), claimant to the throne of Spain as Don Carlos VII, published a proclamation, July 16, 1872, calling upon the people of Catalonia, Aragon, and Valencia to take up arms in his cause, promising to restore their ancient liberties, and in December his brother, Don Alfonso, assumed command of the Carlist forces in Catalonia. Don Carlos himself entered Spain, July 15, 1873, announcing that he came for the purpose of saving the country. Thenceforward there was incessant war in the northern part of the country, but for the most part the struggle was unfavorable to the Carlists, and in February, 1876, when their last stronghold, Estella, had fallen, Don Carlos fled into France. He went to Paris, where, March 3, 1876, he issued a proclamation giving up the struggle but refusing to relinquish his claims. He was expelled from France, in 1881, for ostentatiously supporting the claim of the Comte de Chambord to the French throne. Don Carlos had five children, four daughters and a son. Some time before his death in 1909 Don Carlos abdicated in favor of this son, Don Jaime de Borbón (1870–), Duke of Madrid, who is the present Carlist pretender. Consult: Baumgarten, *Geschichte Spaniens* (Leipzig, 1861); Butler-Clarke, *Modern Spain* (Cambridge, 1906), with a useful bibliography; Hume, *Modern Spain* (London, 1906), an account by one whose family took a considerable part in the events of the first half of the book, and who himself witnessed much of what is related in the last half.

CARLOTA, kār-lō'tā, LA. A town of Negros, Philippines, in the Province of Western Negros, situated 35 miles from Bacolod. Pop., 1903, 13,097.

CARLOTTA (Sp., Charlotte) (1840–). The name generally applied to the ex-Empress of Mexico, Marie Charlotte Amélie, the daughter of

Leopold I, King of the Belgians. She was married at the age of 17 to Archduke Maximilian, of Austria, afterward Emperor of Mexico. She accompanied him to Mexico in 1864, whither, at the suggestion of Napoleon III, he had been invited by the Assembly of Notables. The Empress remained with him until he found it imperative to send her to France (1866) to seek aid from Napoleon III. Her mission was fruitless. She then applied to the Pope, who had blessed Maximilian previous to his departure for his new empire in the Western Hemisphere, but she was again doomed to disappointment. Her failure and the consequences attending the closing days of the Mexican Empire shattered her reason. She was taken to the Château de Laeken, and later to the Château de Bouchoute, not far from Brussels. Some years later, reports stated that she had recovered her reason, but as she continued in seclusion diplomatic investigations were instituted. In 1914 she was still living in retirement.

CARLOVIN'GIAN CY'CLE, THE. A series of poems centred about Charlemagne and his knights, composed chiefly during the tenth and eleventh centuries.

CARLOVINGIANS. See CAROLINGIANS.

CARLOW, kār'lō (Celtic). A small inland county of Ireland, in Leinster Province, with an area of about 346 square miles, of which six-sevenths are arable (Map: Ireland, E 4). The chief towns are Carlow, Tullow, and Bagenalstown. Pop., 1901, 37,700; 1911, 32,910. Consult Ryan, *History and Antiquities of the County of Carlow* (Dublin, 1833).

CARLOW. The capital town of Carlow Co., Ireland, at the confluence of the Burren and the Barrow (which here is navigable), 56 miles southwest of Dublin by rail (Map: Ireland, E 4). It is well built and, with its extensive flour mills, serves as the emporium for the agricultural produce of the district. Pop., 1901, 6513; 1911, 6619. There are remains of a castle, picturesquely situated on an eminence on the Barrow, founded in 1180 by Sir Hugh de Lacy (or perhaps by King John). The town grew up around the castle, which was several times besieged by, and alternately in the possession of, the English and Irish. In the Irish insurrection of 1798 the insurgents attacked the town, but were repulsed with a loss of 600 men. Consult Ryan, *History and Antiquities of the County of Carlow* (Dublin, 1833).

CARLSBAD, kār'l'sbāt. See KARLSBAD.

CARLSBAD. A town and the county seat of Eddy Co., N. Mex., about 230 miles (direct) south-southeast of Albuquerque, on the Pecos River, and on the Pecos Valley and Northeastern Railroad (Map: New Mexico, E 6). It has mineral springs, similar to those of Karlsbad, Bohemia, a county hospital, a public library, and a sanitarium for consumptives. Extensive irrigation projects are being carried on in the vicinity by the United States Reclamation Service. The town has a considerable trade in cattle, sheep, wool, peaches, mohair, and cotton. Carlsbad was settled in 1888. The government is administered by a mayor, elected biennially, and a board of trustees. Pop., 1910, 1736.

CARLSBAD DECREES. The resolutions adopted by a conference of delegates of the principal German states at Karlsbad in 1819 and promptly ratified by the Federal Assembly. They were aimed at the liberal agitation then rampant and were a part of the reactionary policy

of Prince Metternich. The press was put under a strict censorship and the universities under police supervision. The *Burschenschaft* was to be suppressed, and a federal committee of seven was appointed to inquire into "the origin and ramifications of revolutionary conspiracies and demagogic associations." At the Conference of Vienna in the following year constitutions were declared incompatible with the rights of the sovereigns. Consult M. de Martius, *Nouveau recueil général de traités* (Göttingen, 1846). See BURSCHENSCHAFT; METTERNICH.

CARLSBURG, kār'l'sbōrk. See KARLSBURG.

CARLSBONA, kār'l'skrō-nā. See KARLSBONA.

CARLSEN, kār'l'zen, EMIL (1853-). An American landscape and marine painter. He was born in Copenhagen, Denmark, where he studied architecture at the Royal Academy, and came to the United States in 1872. He was first known as a still-life painter, somewhat in the manner of Chattran, whose cool tints strongly appealed to him. His landscapes are sincere and direct in presentation, and his marines are particularly good in the movement of the water, although their luminous Delft-blue color is not always convincing. He excels especially in line and in arrangement. Among his best-known works are "Sooty Kettle," "A Connecticut Hill-top," "The Rising Storm," "Night—Old Wyndham" (1905, Webb prize, Society of American Artists), "Wind in the East," "A Lazy Sea," "A Stormy Afternoon" (1909), "The Sky and the Ocean" (1914). He is represented in the Metropolitan Museum, New York, by a still life and two marines, of which "Surf Breaking" is especially fine; also in the Brooklyn Institute Museum and the Worcester Museum. He received a gold medal at the St. Louis Exposition in 1904, was an influential member of the Society of American Artists till its dissolution, and became a member of the National Academy of Design and of the National Institute of Arts and Letters.

CARLSHAMN, kār'l'shām. See KARLSHAMN.

CARLSON, kār'l'sōn, ANTON JULIUS (1875-). An American physiologist, born at Bohuslän, Sweden. He came to the United States in 1891 and was educated at Augustana College (Ill.) and Leland Stanford Junior University. In 1904 he became instructor at Woods Hole laboratories and in the same year assistant professor in physiology, and in 1909 professor at the University of Chicago. He contributed to journals of physiology papers on saliva and saliva secretion, lymph and lymph formation, heart and circulation, the thyroids, pancreas, and parathyroids, and in 1904 he published *Physiology of the Nervous System of the Snake and the California Hagfish*.

CARLSON, kār'l'sōn, FREDERIK FERDINAND (1811-87). A distinguished Swedish statesman and historian. He was born June 13, 1811, at Kungshamn, in Uppland, and was educated at the University of Upsala. In 1837 he was appointed tutor to the royal princes at Stockholm, a post he held until 1846. In 1849 Carlson succeeded Geijer as professor of history in the University of Upsala, and in 1860 he was chosen rector. From 1850 to 1865 Carlson sat in the national Diet as the representative first of his university and later of the Swedish Academy of Sciences, to which he had been chosen in 1858, and from 1873 on he had a seat in the first Chamber as the representative of Gefleborg. From 1863 to 1870,

and from 1875 to 1880, he was head of the Department of Public Worship. Carlson continued Geijer's seven-volume history of Sweden, *Sveriges Historia under konungarne af Pfalziska huset* (Stockholm, 1855-85). The work has also been published in German, in the Heeren, Ukert, and Giesebrecht series, *Geschichte der europäischen Staaten*.

CARLSRUHE, kār'l'srōō-e. See KARLSRUHE.

CARLSTAD, kār'l'stād. See KARLSTAD.

CARLSTADT, kār'l'shtāt. See KARLSTADT.

CARLSTADT. A borough in Bergen Co., N. J., 9 miles north by west of Jersey City, on the Erie Railroad (Map: New Jersey, D 2). The industrial establishments include brass, marble, and onyx works, silk mills, and manufacturing of white goods, sable cloths, and air valves. The government is vested in a mayor, elected biennially, and a unicameral council. Pop., 1900, 2574; 1910, 3807.

CARLSTADT, kār'l'shtāt, **KARLSTADT**, or **KAROLSTADT**, kār'ōl-shtāt (c.1480-1541). A German reformer whose real name was Andreas Rudolf Bodenstein, and who was at first a friend, but later an opponent of Luther. He was born at Karlstadt, Franconia; studied at the universities of Erfurt (1500-03), Cologne (1503), and Wittenberg (1504), and in the last became a professor, first in philosophy and then in theology. He became a personal friend of Luther. In 1515 Carlstadt went to Rome to study canon law and took the degree of LL.D. Returning to Wittenberg in 1516, he openly broke with scholasticism and defended Reuchlin, against whom a violent persecution was raging. When Luther, on Oct. 31, 1517, nailed his theses to the door of the town church of Wittenberg, Carlstadt supported him. In 1518 he published arguments asserting the supreme authority of the Scriptures, and declaring that in the silence of the Scripture appeals from the fathers of the Church must be made to reason. He participated in the Leipzig Disputation of 1519 on the side of Luther, and in the bull against Luther (1520) Carlstadt was condemned. He was the first to appeal from the Pope to a general council. In 1521, by invitation of the King, he went to Denmark to teach the doctrines of the Reformation; but he returned after a few weeks. On Dec. 26, 1521, he married Anna von Mochau. About this time differences sprang up between Carlstadt and Luther, owing to the former's desire to break at once and entirely with the old church, whereas Luther would go more slowly. While Luther was at the Wartburg (1521), Carlstadt took the lead and, supported by the city government, restored the cup to the laity, abolished the fasting regulations, the elevation of the host, and auricular confession. These changes were very distasteful to the Elector, and so Luther left the Wartburg and opposed them in Wittenberg and restored the old order. Finding his position uncomfortable, Carlstadt became pastor at Orlamünde, in Thuringia (1523), where his radical Church reforms, joined to his well-known independence of Luther, created a suspicion that he was associated with the Anabaptists and that he might be implicated in the schemes of the peasant revolt. The Elector sent Luther to find out the true state of affairs; and when Luther preached against Carlstadt at Jena, the two reformers held a discussion upon the Real Presence, which Carlstadt was the first to deny; and an open quarrel broke out between them. Carlstadt was ordered out of Saxony

(1524) and wandered from place to place, preaching Protestantism. He was at Rothenburg when the Peasant War broke out (1525), and he acted as mediator with the peasants, but in vain. He was pursued and exposed to hardships and even danger to his life. In this extremity he appealed to Luther, who, on condition that he would not advocate his sacramental views, used his influence so successfully that he was permitted to return to Saxony (1525), where for some years he led a life of humble toil and poverty. But controversies again arose over the Lord's Supper, and Carlstadt, who was no longer permitted to dwell in Saxony, fled to Friesland (1530), and finally to Zurich, where Zwingli kindly received him. From 1534 until his death he was professor of theology in Basel. His character was very differently judged in his own times and since, according to whether the sympathies of the person speaking were with Luther or Zwingli. For his life, consult J. C. Jäger (Stuttgart, 1856), and Lindsay, *History of the Reformation*, vol. i (New York, 1906). Many of his letters are in Olearius, *Serinium Antiquarium* (Halle, 1698).

CARLTON. A town in Nottinghamshire, England, 2½ miles northeast of Nottingham, noted for its manufactures of hosiery. Pop., 1901, 10,000; 1911, 15,581.

CARLTON, THE. The leading Conservative political club in London. It was founded in 1832 by the Duke of Wellington, and it now numbers about 2000 members. Its headquarters are at No. 94 Pall Mall, the building being remarkable for its polished granite pillars, which are in imitation of Sansovino's Library of St. Mark at Venice.

CARLTON HOUSE. A house erected for Lord Carlton in the present Carlton House Terrace, London, in 1709, and demolished in 1827. It was made famous by being occupied by the Prince of Wales in 1732, and later by George IV, when he was Prince Regent. The intimates of the Prince of Wales were known as "The Carlton House Set."

CARLUDOVICA PALMATA (Neo-Lat., in honor of Charles IV of Spain, Lat. *Carolus Ludovicus* and Neo-Lat. fem. sing. of Lat. *palmatus*, marked like the palm of the hand, from *palma*, palm of the hand). A South American palmlike plant of the family Cyclanthaceæ. It bears palmate leaves 4 feet across, from which Panama hats are woven, the best of which are plaited from a single leaf stripped in such a manner as to require no joining. In addition to *Carludovica palmata* there are about 40 species, all of them natives of America. They have leaves resembling the fan palms, are very ornamental, and are usually considered by growers as palms, and are treated similarly. See PANAMA HATS.

CARLYLE, kār-līl'. A city and the county seat of Clinton Co., Ill., 48 miles east of St. Louis, on the Kaskaskia River, and on the Baltimore and Ohio Southwestern Railroad (Map: Illinois, C 5). The city contains a courthouse and hospital, and owns its water works and electric light plant. It has manufactures of flour and paper, and a trade in grain and flour. Carlyle was a stopping point for stagecoaches along the route of the old Vincennes trail in the early days. Pop., 1890, 1784; 1900, 1874; 1910, 1982.

CARLYLE, JANE BAILLIE (WELSH) (1801-66). The wife of Thomas Carlyle. She was de-

scended through her father from John Knox and on her mother's side claimed relationship with William Wallace. When Edward Irving was a teacher at Haddington, she was his private pupil, and the friendship thus begun would have culminated in their marriage had it not been for Irving's previous engagement to Miss Martin. When only 14 she had written a tragedy and for many years continued to write poetry. In 1821 Irving introduced Carlyle (who was ignorant of his friend's attachment) to Miss Welsh. They began a correspondence and soon became intimate, although she refused to consider him otherwise than as a friend. In 1822 Irving wrote to her his final letters of farewell, and three years later she and Carlyle were engaged. They were married Oct. 17, 1826. Though there is no doubt that Carlyle sincerely loved his wife or that she reciprocated the feeling, their married life was marred by his uncertain temper, his dyspepsia, the interference of his family, and her critical disposition, which was stimulated by her jealousy and her addiction to the use of opium and other narcotics. Consult Ireland, *Life* (London, 1891) and *New Letters and Memorials* (London, 1903).

CARLYLE, JOHN ATTEN (1801-79). An English physician, brother of Thomas Carlyle. He studied medicine at Edinburgh University, was traveling physician to the Countess of Clare and afterward to the Duke of Buccleuch. After abandoning his practice (1848) he lived for a time at Chelsea near his brother. He made an excellent prose translation of Dante's *Inferno* (1849; rev. 1867). See CARLYLE, THOMAS, the bibliography, and passim.

CARLYLE, JOSEPH DAORE (1759-1804). A Scottish Orientalist. He was born at Carlisle, graduated at Cambridge, and in 1793 succeeded Dr. Paley as chancellor of Carlisle. In 1795 he was appointed professor of Arabic at Cambridge. He had already published (1792) a Latin translation of an Arabic history of Egypt, and in 1796 he issued a volume of *Specimens of Arabic Poetry*. Lord Elgin procured Carlyle's appointment (1799) in the Turkish embassy, so that he traveled in the East, where he collected Greek and Syriac manuscripts for a contemplated revision of the New Testament, but he did not live to do the work. His Arabic Bible, edited and completed by H. Ford, professor of Arabic at Oxford, was published in 1811. His *Poems* were published posthumously (1805).

CARLYLE, THOMAS (1795-1881). A Scottish man of letters born at Ecclefechan, Dumfriesshire, Scotland, Dec. 4, 1795. Educated first at the village school and afterward at Annan, he passed, in 1809, to Edinburgh University, with a view to entering the Scottish church. Here he studied irregularly, but with amazing avidity. The stories which are related of his immense reading are almost fabulous. About the middle of his theological curriculum Carlyle felt wholly disinclined to become a clergyman, and, after a short period spent in teaching at Annan and later at Kirkcaldy, where he formed a lifelong friendship with Edward Irving, he went to Edinburgh and embraced literature as a profession. His first efforts were contributions to Brewster's *Encyclopædia*. In 1824 he published a translation of Legendre's *Geometry*, to which he prefixed an essay on proportion, mathematics having during his college years been a favorite study with him. In 1823-24 appeared in the *London Magazine* his *Life of Schiller*,

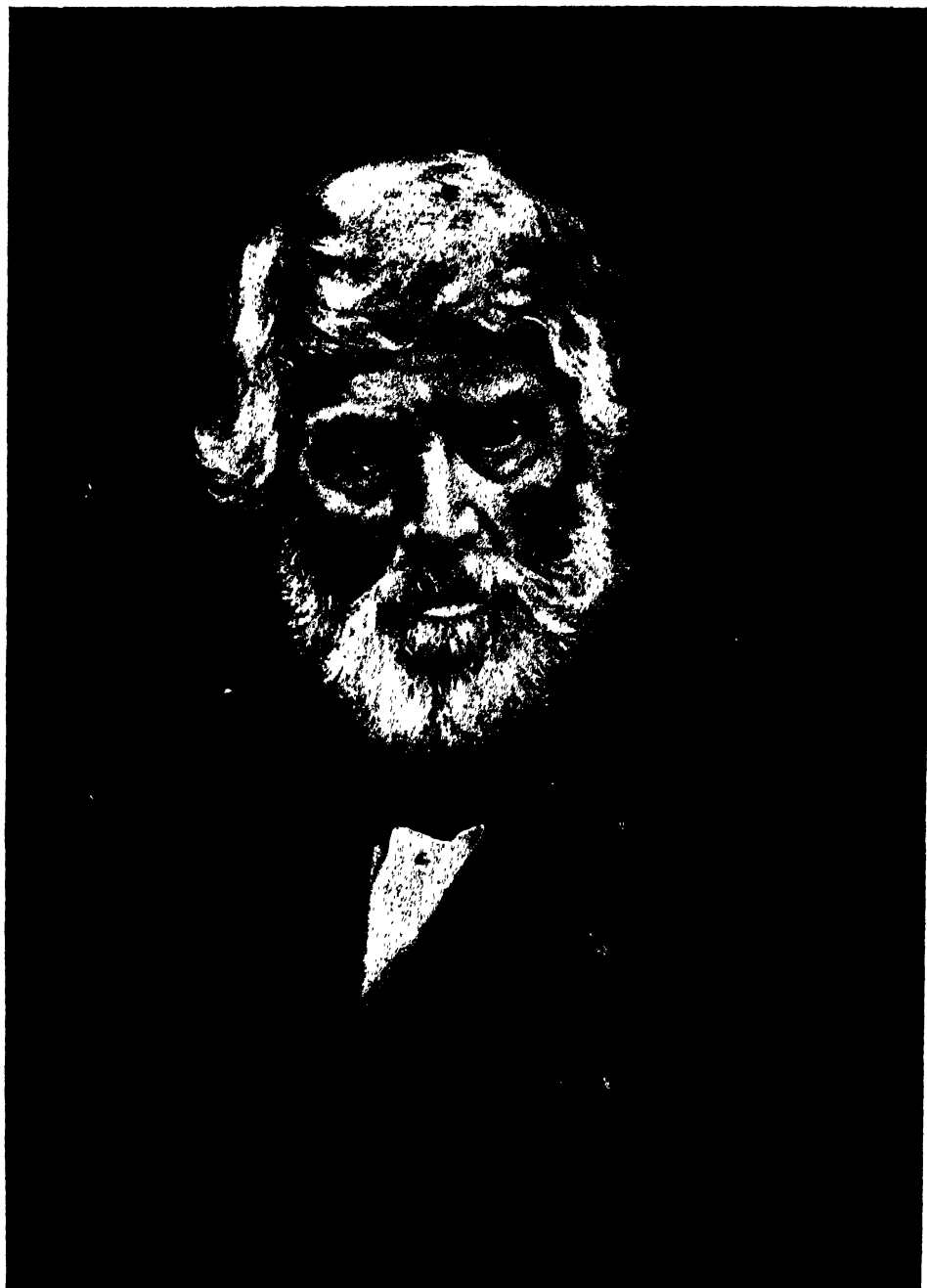
and in 1824 his translation of Goethe's *Wilhelm Meister*. In 1825 the *Life of Schiller* was recast and published in a separate form. It was very highly praised; indeed, one can discern in the criticisms of the book a dawning recognition of the genius of Carlyle. The translation of *Wilhelm Meister* met with a somewhat different fate. De Quincey, in one of his acrid and capricious moods, attacked both Goethe and his translator; while Jeffrey, in the *Edinburgh Review*, admitting Carlyle to be "a person of talents," treated the book in a slashing manner. It is one of the most excellent translations of a foreign work in the English language. In 1826 Carlyle married Jane Baillie Welsh (see CARLYLE, JANE BAILLIE), a lineal descendant of John Knox, and during the same year appeared his *Specimens of German Romance*. From 1828 to 1834 he resided at Craigenputtock, a small estate in Dumfriesshire, belonging to his wife—the "loneliest nook in Britain," as he says himself in a letter to Goethe. Here Carlyle revolved in his mind great questions in philosophy, literature, social life, and politics, to the elucidation of which—after his own singular fashion—he earnestly dedicated his whole life. Here also he continued to write, for various magazines, the splendid series of critical and biographical essays which he had begun two years before. For this work he was admirably equipped. Besides possessing an exact knowledge of the German language, he was also inspired by a conviction that the literature of Germany, in depth, truthfulness, sincerity, and earnestness of purpose, was greatly superior to what was admired and relished at home. He had, moreover, a genius for writing literary portraits. Through him England discovered Germany. One of his most beautiful, eloquent, and solid essays, written at Craigenputtock, was that on Burns (*Edinburgh Review*, 1828). It has given the tone to all subsequent criticism of the Scottish poet. But his chief d'œuvre, written on the moorland farm, was *Sartor Resartus* ("The Tailor Done Over," the title of an old Scottish song). This work, which first appeared in *Fraser's Magazine* (1833-34), is, like most of Carlyle's later productions, an indescribable mixture of the sublime and the grotesque. It professes to be a history or biography of a certain Herr Teufelsdröckh ("Devil's Dirt"), professor in the University of Weissnichtwo ("Kennaquhair"), and contains the manifold opinions, speculations, inward agonies, and trials of that strange personage—or rather of Carlyle himself. The whole book quivers with tragic pathos, solemn aspiration, or riotous humor. In 1834 Carlyle removed to London, taking a house in Cheyne Row, Chelsea. In 1837 appeared *The French Revolution*. Nothing can be more gorgeous than the style of this "prose epic." A fiery enthusiasm pervades it, now softened with tenderness and again darkened with grim mockery, making it throughout the most wonderful image of that wild epoch. Carlyle looks on the explosion of national wrath as a work of the divine Nemesis, who "in the fullness of times" destroys with sacred fury the accumulated falsehoods of centuries. To him, therefore, the Revolution is a "truth clad in hell-fire."

During the same year he delivered in London a series of lectures on German literature; in 1838 another series on *The History of Literature, or the Successive Periods of European Culture*; in 1839, another on *The Revolutions of Modern Europe*; and a fourth in 1840, on *Heroes, Hero-*

Worship, and the Heroic in History. Of these Carlyle prepared only the last for publication (1841). In the meantime he had published *Chartism* (1839). In 1843 followed *Past and Present*, which, like its predecessor, showed the deep, anxious, sorrowful interest Carlyle was taking in the actual condition of his countrymen. In 1845 he published what is considered by many his masterpiece, *Oliver Cromwell's Letters and Speeches, with Elucidations and a Connecting Narrative*. The research displayed in this book is marvelous, but the author was nobly rewarded for his toil by the abundant admiration given to his work. In 1850 appeared the *Letter-Day Pamphlets*, the fiercest, most sardonic, most furious of all his writings. These vehement papers were followed in the next year by the *Life of Sterling*, calm and tender in tone. For many years Carlyle had been at work on the *History of Frederick the Great*. The vast undertaking, resulting in 6 vols., was at length carried through (1858-65). In 1865 Carlyle was elected lord rector of Edinburgh University.

The sudden death of Mrs. Carlyle, in 1866, overwhelmed her husband with grief. Henceforth his life became more and more secluded. His work was now done. In 1867 Carlyle visited Mentone, where he composed part of his personal *Reminiscences*; then returning to London, contributed to *Macmillan's Magazine* an article entitled "Shooting Niagara," in which he gave his views of democracy. In 1875 appeared the *Early Kings of Norway*. In 1874 he received the Prussian royal order *Pour le Mérite* in recognition of his having written the life of Frederick the Great; and in the same year he was offered by Disraeli the Grand Cross of the Bath and a liberal pension, but he declined them both. On Feb. 4, 1881, he died at his house in Chelsea and was buried among his kindred at Ecclefechan. His wife rests beside her father at Haddington. Carlyle appointed James Anthony Froude his literary executor, who, in conforming with the terms of the trust, published *Carlyle's Reminiscences* (1881); *History of First Forty Years of Carlyle's Life* (1882); *Letters of Jane Welsh Carlyle* (1883), exhibiting her as an accomplished woman and brilliant letter writer and giving an insight into her moments of unhappiness and jealousy; and *History of Carlyle's Life in London* (1884). A revulsion of feeling regarding Carlyle's character followed, the literary world being shocked by the bitterness and spite abounding in these records, and Froude was attacked with great violence for his indiscretion. A curious and not wholly edifying controversy arose as to whether Carlyle's troubled relations with his wife were due to his physical incapacity as a husband; and this topic, as was the case with a like discussion regarding John Ruskin (q.v.), brought forth a swarm of books and monographs. But time has revived the former admiration for Carlyle's genius. In 1882 a statue was erected to his memory on the Chelsea embankment, and in 1895 his house in Cheyne Row was purchased and opened to the public.

Bibliography. Carlyle's *Collected Works* first appeared in 1857-58. A centenary edition of his works was published in London and New York, 1896-99. Earlier and later editions abound, both of the collected works and of individual works. Shepherd's *Bibliography of Thomas Carlyle* was published in 1882. For a list of articles on Carlyle and his work, see



THOMAS CARLYLE ..
FROM THE PAINTING BY P. KRÄMER

Notes and Queries, 6th series, vol. iv. Indispensable books for a study of Carlyle's life are his own *Reminiscences* (1881); *Letters and Memorials of Jane Welsh Carlyle* (1883); *Love Letters of Thomas Carlyle and Jane Welsh* (ed. A. Carlyle, 1909); J. A. Froude, *History of First Forty Years of Carlyle's Life* (1882); *History of Carlyle's Life in London* (1884). Consult also: *New Letters and Memorials of Jane Welsh Carlyle*, with introduction by Sir James Crichton-Browne (1903); J. A. Froude's *My Relations with Thomas Carlyle*; *The Nemesis of Froude* (1903), in which Sir J. Crichton-Browne and Alexander Carlyle collaborated; Herbert Paul's *Life of Froude* (1905). Important biographical and other material is included in these collections of letters: *The Correspondence of Thomas Carlyle with Ralph Waldo Emerson* (1883), *Early Letters of Thomas Carlyle* (1886; 2d series, 1888), *Correspondence between Goethe and Carlyle* (1887)—all edited by C. E. Norton; also Copeland, *Carlyle's Letters to his Youngest Sister* (1889). Consult also: Shepherd and Williamson, *Memoirs of the Life and Writings of Thomas Carlyle* (1881); Wylie, *Thomas Carlyle, the Man and his Books* (1881); Masson, *Carlyle Personally and in his Writings* (1885); Garnett, *Life* (1887); Nicoll, *Life* (1894); Wilson, *Froude and Carlyle* (1898); R. S. Craig, *The Making of Carlyle* (1909), a book of uneven value; *Letters of Carlyle to the Socialists of 1830* (1909); F. W. Roe, *Carlyle as a Critic of Literature* (1910), a competent and useful work.

CARLYLE, WILLIAM ARTHUR (1862-). A Canadian mining engineer, born in Hamilton, Ontario. In 1887 he graduated at McGill University, where he was later special lecturer in mining and metallurgy (1891-95) and professor of mining and engineering (1895). For three years he was provincial mineralogist and director of the Department of Mines, British Columbia. In 1898 he went to Rio Tinto, Spain, where he was general manager of the Rio Tinto Company until 1908. In the latter year he went to London, England, where he became a consulting engineer, and in 1909 was appointed professor of technology and metallurgy in the Imperial College of Science.

CARMACK, EDWARD WARD (1858-1908). An American journalist and politician, born near Castalian Springs, Tenn. He practiced law at Columbia, Tenn., and became a member of the State Legislature in 1884. In 1886 he entered journalism on the editorial staff of the *Nashville American*, two years later founded the *Nashville Democrat*, and when the *American* absorbed the *Democrat* he became editor in chief. He moved to Memphis in 1892 and undertook the editorship of the *Memphis Commercial*. From 1897 to 1907 he was a member of Congress, and from 1901 to 1907 United States Senator. In 1906 on a platform of State-wide prohibition he bitterly contested with Governor Patterson the Democratic nomination for governor, but was defeated. The caustic editorials by Carmack in his newspaper, the *Tennessean*, during this fight, resulted in his assassination by Robin J. Cooper, the son of his long-time bitter political opponent, Col. Duncan B. Cooper. He published *Character; or, the Making of the Man* (1909).

CARMAGNOLA, kăr'mă-nyô'lă (from the Italian town *Carmagnola*) (c.1390-1432). An Italian condottiere, whose real name was FRAN-

CESCO BUSSONE. For Filippo Maria Visconti, Duke of Milan, he subdued Bergamo, Brescia, Parma, Genoa, and other cities. Brought by his enemies into ill favor with the Duke, he offered his services (1425) to Venice and led a most successful campaign against Milan. After the defeats of a second campaign, the Republic, suspecting treason, caused him to be beheaded, in spite of the Doge's interposition. His fate has been celebrated in Manzoni's tragedy, *Il conte di Carmagnola* (1820). Consult Horatio Brown, *Studies in Venetian History* (London, 1907).

CARMAGNOLE, kăr'mă'nyôl' (Fr., perhaps from the Italian town *Carmagnola*). The name of a popular song and dance during the French Revolution, rivaling in popularity among patriots and soldiers the "Marseillaise" and the famous "Ça Ira" (qq.v.). It first became well known after the storming of the Tuileries, Aug. 10, 1792. The song began with:

"Madame Vêto avait promis,"

and every verse ended with the refrain:

"Dansons la Carmagnole,
Vive le son, vive le son;
Dansons la Carmagnole
Vive le son du canon!"

The words, however, did not always remain the same; couplets were added from time to time descriptive of the famous incidents of the Revolution, so that the Carmagnole became a typical song of the streets. Fashion soon adopted the word, which was next applied to a sort of jacket worn as a symbol of patriotism. Afterward it was applied to the bombastic and fanatical reports of the successes and glory of the French arms. With the passing of the Reign of Terror the song practically disappeared.

CARMAN, ALBERT (1833-1917). A Canadian Methodist clergyman, educator, and administrator, born at Iroquois, Ontario. He was educated at the Dundas Grammar School and at Victoria University, Cobourg, where he graduated in 1855. In 1857 he was appointed professor of mathematics in Albert College, Belleville, becoming principal in 1858. Through his exertions the college was affiliated with Toronto University in 1860, received a university charter in arts in 1866, and in 1868 was created Albert University, with a charter in all the faculties, Carman becoming its first chancellor. In 1859 he was ordained a minister of the Methodist Episcopal church in Canada, and in 1874-83 was its Bishop. For some time previous to the latter year the organic union of the various Methodist denominations in Canada had been discussed, and after it had been accomplished in 1883, and the united body given the name of The Methodist Church, Carman became general superintendent, an office which he held more than 30 years. He was prominently identified with the founding of Alma Ladies' College, St. Thomas, and was appointed a senator of Toronto and Victoria universities and a governor of Wesleyan Theological College, Montreal. He early became a strong advocate of prohibition. In 1906 he made a tour of the world in the interest of missions.

CARMAN, WILLIAM BLISS (1861-). A Canadian journalist and poet. He was born at Fredericton, New Brunswick, April 15, 1861. He was graduated at the University of New Brunswick (1881), studied at the University of Edinburgh (1882-83), at Harvard (1886-88), prac-

ticed engineering, taught, and became literary editor of the *New York Independent* (1890-92). His first volume of verse, *Low Tide on Grand Pré* (1893), commanded general and favorable attention. It was followed by *Songs from Vagabondia* (1894), in which a number of the lyrics were by Richard Hovey; *A Sea-Mark* (1895); *Ballads of Lost Haven* (1897); *By the Aurelian Wall* (1898); *More Songs from Vagabondia* (1896); *Last Songs from Vagabondia* (1900); *Kinship of Nature* (1903); *Pipes of Pan* (1904-05); *From the Book of Valentines* (1905); *The Making of Personality* (1908); *Daughters of Dawn* (London, 1912; New York, 1913). See CANADIAN LITERATURE.

CARMARTHEN, or **CAERMARTHEN**, *kâr-mâr'then* (Welsh, *Caer Fyrdyn*, the *Maridunum* of Ptolemy). A seaport town, capital of Carmarthenshire, south Wales, on the right bank of the Towy, 25 miles north-northwest of Swansea (Map: Wales, B 5). It lies in a picturesque situation, but the streets are irregular, steep, and often narrow. The Towy is navigable for vessels of 200 tons up to the town. There are tin and iron works in the neighborhood, and the town carries on a considerable export trade in tin plates, cast iron, timber, marble, slates, lead ore, grain, butter, and eggs. Pop., 1901, 10,025; 1911, 10,221. Near Carmarthen are the remains of two Roman camps. The neighborhood along the banks of the river was, according to tradition, one of the favorite haunts of Merlin the Enchanter. It was long the residence of the native princes of south Wales.

CARMARTHENSHIRE, or **CAERMARTHENSHIRE**. A maritime county in south Wales, on the Bristol Channel. It is bounded north by Cardigan, from which it is separated by the Teifi; east by Brecon; south by Carmarthen Bay; and west by Pembroke (Map: Wales, B 5). It is the largest of the south Welsh counties; area, 918 square miles, nearly a third of which is waste. Iron, coal, copper, and lead mining, stone quarrying, cattle raising, grain culture, hide curing, and woolen manufactures are the chief industries. The chief towns are Carmarthen (the county town), Llanelly, Llandeilo-Fawr, Llandovery, Newcastle-in-Emlyn, and Kidwelly. Pop., 1901, 135,251; 1911, 160,430.

CARMEL. 1. A mountain range rising abruptly from the plain of Dothan, near Jenin, and extending in a northwest direction for about 25 miles (Map: Palestine, B 2). The northwest end is almost at the Mediterranean Sea and terminates as abruptly as the eastern. The highest point of the range is 1810 feet above sea level. On the east side is the Plain of Esdraelon, watered by the brook Kishon, and on the southwest side the Plain of Sharon. Carmel was always productive, so that some prophetic writers mention it along with Sharon and Bashan as a type of a land that is richly blessed (Isa. xxxv. 2; Jer. i. 19; Mic. vii. 14). Pliny mentions a city on the mountain (*Historia naturalis*, v, xvii), and it is not improbable that in earlier days there were towns in this district. The mountain formed a natural barrier affecting the course taken by invaders, but did not itself play any part in the military history of Syria. It was important, however, as a sacred mountain. According to the story told in 1 Kings xviii. 19-40, it was on Carmel that, in answer to Elijah's prayer, "the fire of Yahweh fell and consumed the burnt offering,

and the wood, and the stones, and the dust, and licked up the water that was in the trench," and from Carmel that "Elijah brought the prophets of Baal down to the brook Kishon and slew them there." (See ELIJAH.) This story shows that Carmel was deemed an appropriate place for the erection of an altar to Yahweh as well as an altar to Baal. Elisha also is said to have visited Carmel (2 Kings ii. 25) and to have resided there when the Shunammite woman called upon him and he went with her and raised her son from the dead (2 Kings iv. 25). Whatever may be the truth as to the visit of Pythagoras to Carmel related by Jamblichus (*De vita Pythagoræ*, ed. Arceer, 1598, iii, pp. 33 f.), the reference to Carmel as a mountain and sanctuary of Zeus in the *Periplus of Scylax* (ed. Hudson, p. 42) shows that a pagan religious cult was carried on there c.400 B.C. Tacitus describes it as the site of an oracle, without an image (*Hist.* ii. 78), and Suetonius relates that Vespasian offered a sacrifice there and received from the priests an oracle predicting that he would become Emperor (*Vita Vespasiani*, 5). Anchorites established themselves there in the early days of Christianity, and many monasteries were built along the range in the course of time. Phocas saw the ruins of such a monastery in 1185; Brocard, in 1209, persuaded the Patriarch of Jerusalem, Albert, to formulate the rules of the Carmelite monks. Napoleon used a monastery on Carmel in 1799 as a hospital for the sick and wounded in his army. This monastery was destroyed by Abdallah Pasha in 1821, but was soon rebuilt in a splendid manner through the efforts of Frascati. A German colony now cultivates a portion of the range and has built a sanitarium upon the highest part. At the traditional site of Elijah's sacrifice, Al Mahraka, or "the burning," the Druses (q.v.) still have a sanctuary and are said to perform a sacrifice there every year. Consult: Guérin, *Description de la Palestine: Samarie*, vol. ii, pp. 260 ff. (1875); Conder, *Tent Work in Palestine*, vol. i, pp. 169 ff. (1878); Laurence Oliphant, in *Palestine Exploration Fund, Quarterly* (1882-86 passim); G. A. Smith, *Historical Geography of the Holy Land* (1895); Buhl, *Geographie des Alten Palästinas* (1896); Benzinger, in *Baedeker's Palestine and Syria* (5th ed., 1912).

2. A city of Judah about 8 miles south-southwest of Hebron. After his conquest of the Amalekites (q.v.) Saul erected a triumphal stele in this place (1 Sam. xv. 12). Here Nabal lived, whose widow, Abigail, became a wife of David (1 Sam. xxv. 2). It is spoken of as a very great town by Eusebius. Amalric camped there when he went to meet Saladin in 1172 (William of Tyre, xx, xxx). It is represented by Khirbet Kurmul, where there are ruins left of the twelfth century. See Robinson, *Biblical Researches in Palestine*, vol. i (2d ed., 1856), pp. 496 ff.; Guérin, *Description de la Palestine: Judée*, vol. iii, pp. 166 ff. (1869).

CARMEL. A town and the county seat of Putnam Co., N. Y., 50 miles (direct) north by east of New York City; on Lake Gleneida and on the New York Central and Hudson River Railroad (Map: New York, B 2). It is the seat of Drew Seminary for Young Women, and has a Literary Union Library. Carmel is in a rich agricultural and dairying region. Within the limits of the town is the celebrated summer resort, Lake Mahopac. Carmel was the birth-

place of Daniel Drew (q.v.), and here Enoch Crosby, the "spy" of Cooper's celebrated novel, is buried. Pop., 1890, 2912; 1900, 2598; 1910, 2610.

CARMEL, KNIGHTS OF THE ORDER OF OUR LADY OF MOUNT. An order instituted by Henry IV of France to take the place of the Knights of St. Lazarus of Jerusalem, suppressed by him. It consisted of 100 gentlemen, all French, who were required to follow in general the Carmelite rule, as far as their life in the world would allow. The order was confirmed by bull by Pope Paul V in 1608. The first grand master was Philibert de Nerestang, who had held the same position in the Order of St. Lazarus. Louis XIV restored the earlier name and combined it with the later. In his time the order numbered 145 commanderies, but the French Revolution put an end to it.

CARMELITES, or ORDER OF OUR LADY OF MOUNT CARMEL. One of the four great orders of mendicants. A monastic order about whose origin there has been no little controversy. At one time it was piously believed to have been founded by the prophet Elijah; but this belief was dissipated by the learned editors of the *Acta Sanctorum*, who were able to demonstrate that it owed its origin to the Crusader Berthold. He had become a monk in Calabria in fulfillment of a vow made on the eve of a battle in which he was victorious. In 1156, with 10 companions, he took up his abode on Mount Carmel; their first definite rule was given them in 1208 by Albert, Patriarch of Jerusalem. In 1240 the pressure of Mohammedan domination induced them to abandon their settlement. Offshoots had already (1238) been founded in Cyprus and Messina; and now some went to Provence and some to England. Innocent IV, in 1245, sanctioned the change from a hermit to a community life and ranked them with the mendicant orders. At a general chapter held at Aylesford, in Kent, the same year, an Englishman, Saint-Simon Stock, was elected the first general. Under his leadership the order, with some modifications adapting it to climatic and other differences, spread throughout central and western Europe. It is to him that the Virgin Mary is said to have revealed in a vision the scapular which became a distinctive mark of the order and those who were affiliated to it. From the white cloak which they wore, they received in England the popular name of White Friars. The rigidity of their rule was somewhat relaxed by Eugenius IV in 1431; but some communities, objecting to this change, adhered to the stricter rule and were known as Observantines, while the more lax were called Conventuals. The most thoroughgoing reform was that instituted by St. Theresa (q.v.), who became a Carmelite novice in 1531 and labored unceasingly for a stricter discipline among the nuns. With the aid of St. John of the Cross, she thus affected the male members of the order also. At her death, in 1582, there were 17 houses of women and 15 of men who followed the stricter rule and were known as Discalced or Barefooted Carmelites. The order had 52 houses in England at the time of the dissolution of the monasteries. They have been active in missions and in the spread of mystical theology. There are at present about 500 Carmelite convents and nunneries.

CARMEN. An opera by Bizet, based on the Spanish gypsy romance by Mérimée. It was

first produced in Paris, March 3, 1875; in the United States, October 23, 1878 (New York). See BIZET; MÉRIMÉE.

CARMEN SÆCULARE, sæk'ù-là'rè. An ode by Horace, sung at the Secular Games in 17 B.C. by a chorus of boys and one of girls. It was written at the request of Augustus.

CARMEN SYLVA, sîl'vâ. See ELIZABETH, QUEEN OF RUMANIA.

CARMEN TAL GATE. A gate of ancient Rome named after the Italian goddess Carmenta, near the Capitoline Hill. Since through it the Fabii marched against Veii the gate was called Scelerata, the accursed. See FABII.

CARMI, kâr'mî. A city and the county seat of White Co., Ill., 38 miles west by north of Evansville, Ind., on the Louisville and Nashville and the Cleveland, Cincinnati, Chicago, and St. Louis railroads and on the Little Wabash River (Map: Illinois, D 5). It is the centre of an agricultural region and exports fruit, grain, flour, tile, and lumber, and has flouring and saw mills, brick and tile works, machine shops, a stove and heading factory, an ice factory, etc. The water works and lighting plant are owned by the city. Pop., 1890, 2785; 1900, 2939; 1910, 2833.

CAR/MICHAEL, JAMES (1832?-1908). A Canadian Anglican bishop. He was born in Dublin, Ireland, and was partly educated in that city, but in early manhood came to Canada, and after a course of theological study was ordained priest in 1859. After filling a number of minor appointments he became, in 1882, rector of St. George's, Montreal. His sermons were remarkable for eloquence and for the wide acquaintance manifested with the phases of modern scientific thought and the higher criticism. In 1883 he was appointed dean of Montreal; in 1892 he became prolocutor of the Provincial Synod, and in 1893 prolocutor of the General Anglican Synod of Canada. In recognition of his scientific attainments he was twice appointed president of the Montreal Microscopical Society and also twice president of the Natural History Society. For several years he delivered annual courses of lectures to men, principally on the relations between science and religion. He became Bishop of Montreal and remained in that position until his death.

CAR/MINA BUR'NA. See GOLIARDIC LITERATURE.

CARMIN'ATIVES (Fr. *carminatif*, Neo-Lat. *carminativus*, from Lat. *carminare*, to card wool). Medicines which relieve flatulence and pain in the stomach or bowels by stimulating the circulation, increasing peristalsis, and imparting a sense of warmth and comfort. Among the principal carminatives are asaetida, ginger, camphor, cardamoms, fennel, valerian, and the oils of anise, cajeput, caraway, coriander, and peppermint.

CAR/MINE (Fr., ML. *carmesinus*, Pers. *qirmiz*, crimson, from Skt. *krmijâ*, produced by a worm, from *krmi*, worm + *janati*, *jâyatê*, to be born). A beautiful red pigment obtained from cochineal and employed in the manufacture of the finer red inks, in the dyeing of silk, in coloring artificial flowers, and in miniature and water-color painting. It was first prepared by a Franciscan monk at Pisa, who discovered it accidentally while compounding some medicine containing cochineal, and in 1666 it began to be manufactured. One process for its preparation is as follows: Digest 1 pound of cochineal in 3

gallons of water for 15 minutes, add 1 ounce of cream of tartar, heat gently for 10 minutes, add half an ounce of alum, boil for 2 or 3 minutes, and, after allowing any impurities to settle, place the clear liquid in clean glass pans, in which the carmine will be slowly deposited; after a time drain off the liquid and let the carmine dry in the shade. An excellent quality of carmine may also be obtained by pulverizing cochineal, treating it with a solution of sodium carbonate, adding albumin to the solution, and then precipitating with dilute acid. The coloring principle of cochineal is carminic acid, $C_{17}H_{13}O_{10}$, an amorphous red substance soluble in water and in alcohol. With zinc oxide and alumina carminic acid forms the valuable coloring substance known as carmine lake, which is made from the residues of cochineal obtained in the manufacture of carmine. Carmine lake is still used in painting and in printing, but is being superseded by the coal-tar colors.

CARMO, kâr'mô. See KARMÖ.

CARMO. See CARMONA.

CARMONA (Sp., of Celtiberian origin).

A city of Spain, in the Province of Seville, 20 miles northeast of Seville (Map: Spain, C 4). It is situated on an elevated ridge overlooking a fertile plain, and with its Moorish walls and castle has a very picturesque appearance. It contains the fine Gothic church of Santa María; the church of San Pedro, with a tower similar to the Giralda of Seville; a ruined Alcázar; and the interesting gates leading to Córdoba and Seville. A short distance from the city to the west is a Roman necropolis of great archaeological value. An amphitheatre and additional tombs were discovered in 1881, and all belong to the first four centuries A.D. A small museum, supported by the local archaeological society, takes care of these antiquities. The city has flour and oil mills, manufactures of woolen cloth, hats, leather, etc., and an important annual fair, at which one may study satisfactorily the habits and costumes of southern Spain unspoiled by too much modernity. Pop., 1900, 16,338; 1910, 18,855. Carmona (known as Carmo) was of considerable importance under the Romans, a prominence which it retained in the Middle Ages. It fell into the power of the Moors, from whom St. Ferdinand of Castile took it in 1247. Consult M. Sales y Ferré, *Estudios arqueológicos é históricos* (Madrid, 1887).

CARMONTELE, kâr'môn'tél' (1717-1806).

A French dramatist, really named LOUIS CARBONIS. He was born in Paris, and for several years was reader to the Duke of Orleans, grandson of the Regent. His literary reputation rests chiefly on his *Proverbes dramatiques* (10 vols., Paris, 1768-81; new ed., 4 vols., Paris, 1822), a series of short comedies adapted for private theatricals. In addition to this work, which has been freely borrowed from by later comic writers, his *Théâtre de campagne*, a collection of more than 25 comedies (4 vols., 1775), should be mentioned. He painted portraits, mostly profiles, of some of the most eminent persons of the eighteenth century. *Proverbes et comédies posthumes de Carmontelle* was published, with a memoir by Mme. de Genlis (3 vols., Paris, 1825).

CARNAC, kâr'nák' (Celtic). A Breton parish and village in the Department of Morbihan, France, 17 miles southeast of Lorient (Map: France, C 4). The village, situated on a gentle slope overlooking the Bay of Quiberon, has an

interesting archaeological museum and a church built in 1639. The latter contains some fine marble altarpieces of the Renaissance period. The inhabitants are engaged in agricultural and fishing pursuits and coasting trade. Pop., 1901, village, 646, commune, 3125; 1911, village, 780, commune, 3269. The parish has world-wide fame in connection with some of the most remarkable megalithic monuments extant and with the remains of a Gallo-Roman town. The chief megalithic relics are situated about half a mile to the north of the village, near the road leading to Auray, on a spacious desolate plain bordering the seashore. They consist of long lines of roughly hewn granitic menhirs or standing stones, varying from 3 to 18 feet in height, which, weather-beaten and covered with minute white lichens, present a succession of weird avenues.

There are three groups, containing 1991 menhirs; in the sixteenth century they numbered more than 15,000. Their exploitation for building purposes and to make room for agricultural improvements during the succeeding three centuries has been arrested by their becoming national property and being authoritatively classed among historical monuments. A fine view of the lines is obtained from the summit of Mont Saint-Michel, a grass-grown "galgal" or tumulus, 65 feet high and 260 feet in diameter, consisting of blocks of stone piled over a dolmen and crowned with a chapel dedicated to the Archangel Michael.

The origin and object of these ancient monuments remain a mystery. They have been the subject of much archaeological speculation and are generally considered to be the Celtic monuments of a Druidical cult, traces of which exist in some of the primitive customs of the natives.

In the year 56 B.C., from these shores Cæsar watched the naval victory of Decimus Brutus the younger over the Veneti in the Bay of Quiberon. The Romans occupied Brittany during five centuries, and considerable remains of Gallo-Roman habitations, with interesting relics, have been excavated at the Bossenno, i.e., mounds, on the plain, 1 mile to the east of Carnac, and also at the base of the artificial Mont Saint-Michel. Consult: Galles, *Fouilles du Mont Saint-Michel en Carnac* (Paris, 1864) and *Tumulus et dolmens de Kercado* (Paris, 1864); Fouquet, *Des monuments celtiques et ruines romaines dans le Morbihan* (Paris, 1873); Lukis, *Chambered Barrows and Other Prehistoric Monuments in Morbihan* (London, 1875); Miln, *Excavations at Carnac* (2 vols., Edinburgh, 1877-81); Worsfold, "The French Stonehenge," in *British Archaeological Association Journal*, vol. iv (London, 1898). See Plate of MEGALITHIC MONUMENTS.

CARNALL, RUDOLPH VON (1804-74). A German mining engineer, born at Glatz (Silesia). He studied in Berlin in 1823-24, began an active connection with the mining industry in Upper Silesia, and by 1855 had risen to be a superintendent of mines and director of the general mining office in Breslau. In 1848 he assisted in founding the German Geological Society, and from 1849 to 1855 lectured at the University of Berlin on the science of mining engineering. He was a councilor in the mines and mining section of the Prussian Ministry of Commerce from 1855 to 1861. The *Zeitschrift für das Berg-, Hütten- und Salinenwesen im preussischen Staate* was founded by him, and he

rendered other important services to the development of German mining.

CARNARVON, or **CAERNARVON**, *kär-när-von* (Welsh, *Caer-yn-ar-Fon*, fort opposite Mona or Anglesey). A parliamentary and municipal borough and seaport in north Wales, the capital of Carnarvonshire, situated near the south end of the Menai Strait, on the right bank of the Seiont, about 69 miles west of Chester (Map: England, B 3). The castle, which was begun in the reign of Edward I, about 1283, is generally considered the handsomest and most extensive mediæval fortress in the United Kingdom. It is built of red stone and is an irregular oblong in shape. The outer walls, from 8 to 14 feet in thickness, containing a passageway, are fortified by 13 polygonal towers. In the Eagle Tower the first Prince of Wales (afterward Edward II) is said to have been born. The town itself was once surrounded by walls and round towers. These walls, with several of the gates, still exist and form a pleasant promenade. The streets are narrow, but regular, and at right angles to each other. The town is well lighted, and has a good water supply. It is an important commercial centre. The harbor admits ships of 400 tons. The chief exports are copper ore, coal, and slates, which are brought into the town by rail from the quarries in the neighborhood. There is also a great iron and brass foundry. There are manufactures of writing slates, enameled slate slabs, and tobacco. Carnarvon is a bathing place and is much frequented by tourists on account of its vicinity to the grandest scenery in north Wales. Pop., 1891, 9804; 1901, 9760; 1911, 9119. Half a mile from Carnarvon are the remains of Segontium, or Cær Seiont, a Roman station or city. There is a Roman fort on the left bank of the Seiont, still almost complete. The Earl of Chester fortified the place in 1098. In 1294 the town and castle were burned and the English inhabitants massacred by the Welsh under Madoc, the son of Llewelyn. Consult Hartshorne, "Carnarvon Castle," *Archæological Journal*, vol. vii (London, 1850).

CARNARVON, **HENRY HOWARD MOLYNEUX HERBERT**, fourth EARL OF (1831-90). An English Conservative statesman. He was born in London, June 24, 1831, and succeeded to the peerage in 1849. Educated at Eton and Christ Church, Oxford, in 1852 he obtained a first class in classics, and, after taking his degree the following year, traveled through the Orient. In 1860, as a souvenir of the journey, he published a work entitled *The Druses of the Lebanon*. At his majority he took his seat in the House of Lords, and in 1858 Earl Derby made him Colonial Undersecretary. In 1859 he was elected high steward of Oxford University and created D.C.L. In 1866 he was appointed Colonial Secretary, and his policy met with the warmest approval. He framed a bill for the confederation of the British North American colonies, and had moved the second reading when he resigned office upon the Reform Bill of 1867, which he condemned as democratic and dangerous. On Disraeli's return to office, in 1874, Lord Carnarvon again became Colonial Secretary, but resigned in 1878. He was Lord Lieutenant of Ireland (1885-86) and died in London, June 28, 1890. He was the author of an address on *Berkshire Archaeology* (1859); in 1869 edited *Reminiscences of Athens and the Morea*, by the late Earl of Carnarvon, his father, and published translations of the *Agamemnon* (1879), the *Odyssey* (1886), and *Prometheus Vinculus* (1893).

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CARNARVONSHIRE. A maritime county in north Wales, bounded north by the Irish Sea, east by Denbigh, with the Conway between, south by Merioneth and Cardigan Bay, and west by Carnarvon Bay and the Menai Strait, the latter separating it from Anglesey (Map: England, B 3). Area, 565 square miles, of which one-half is in pasture and only one-fortieth in tillage. The surface is mountainous. The mineral products of Carnarvonshire are copper, lead, zinc, coal, roofing and writing slates, slabs, chimney piers, and honestone. The slate quarries employ many thousands of workmen. The chief branch of rural industry is the rearing of black cattle for the dairy and of small sheep. Wheat, oats, barley, and potatoes are raised in the valleys. The chief towns include Carnarvon (the county town), Bangor, Pwllheli, and Conway. Pop., 1901, 125,649; 1911, 125,049.

CARNATIC (from Skt. *Karnāta*, name of a people in southern India). A political division on the eastern or Coromandel coast of the presidency of Madras, peninsula of India. The name formerly applied only to the Karonese country between the Eastern and Western Ghats; the Carnatic now includes the districts of Belgaum, Dharwar, Byapur, part of North Kanara, and the native states of the Southern Mahratta agency of the Kolhapur. The old Carnatic is famous in history as the grand theatre of the struggle in the middle of the eighteenth century between France and England for supremacy in India. It was at that time ruled by the Nawab of Arcot, who was a vassal of the Nizam of Hyderabad. The region was annexed by the British in 1801. See Robert Sewell, *A Forgotten Empire* (London, 1900).

CARNATION (Fr., Lat. *carnatio*, from *caro*, flesh). The common name of the various, usually double-flowering cultivated forms of the clove pink (*Dianthus caryophyllus*). This species is a native of the south of Europe and has been in cultivation for more than 2000 years. It is a semihardy perennial (generally cultivated as an annual in America), 2 to 3½ feet high, with a branching stem, opposite linear leaves, terminal flowers, and blossoming in England from June to August. The clovelike fragrance of the flowers gave to the plant its specific name *caryophyllus* (clove tree, *Caryophyllus aromaticus*, now *Eugenia caryophyllata*). Many varieties, with various forms and colors, are in cultivation. Red, white, pink, and yellow varieties predominate. Variegations usually occur on body colors of white or yellow and are known as *flakes*, when striped with only one color; *bizarres*, when striped with two or three colors, and *picotees*, when the petals are merely edged or bordered with another color.

The monthly, tree, or perpetual-flowering carnations are the varieties so extensively grown under glass in the United States for winter cut flowers. Hundreds of improved forms have been bred in America during the past 20 years. American carnations are now being grown in Europe with increasing favor. These are propagated from cuttings taken from December to May, rooted in sand, transplanted to plants or pots, and kept in a cool house until danger from heavy frost is past, when they are set in the field.

Sandy loam soil heavily fertilized is preferred. The plants are set in rows 12 inches apart and

10 inches distant in the row when cultivated by hand, and in 3-foot rows when worked with a horse. If winter flowers are wanted, the rising shoots of the plants are regularly pruned back to 2 to 4 inches during the summer. In September the plants are lifted and transplanted to the forcing-house benches. The soil here is 4 to 5 inches deep, and consists usually of three-fourths loam and one-fourth well-rotted manure. The plants are set 8 to 12 inches apart each way, heavily fertilized, and watered frequently with liquid manure. The temperature of the carnation house during the winter is maintained at 60° to 65° in the daytime and 10 degrees lower at night. Instead of being set in benches, the plants are sometimes set in pots, and may either be forced at once or set in cold frames and carried over for spring flowering. The Marguerite carnation, a comparatively new, dwarf, and free-flowering strain, is now extensively grown, both as a garden annual and as a pot plant. The Malmaison carnation, a very large-flowered strain, is frequently grown by European florists. It is not a perpetual bloomer and does not force as well as the American carnation. Consult Sanders, *Carnations, Picotees and Pinks* (London, 1910), and Ward, *The American Carnation* (New York, 1903). See FLORICULTURE.

Carnation Diseases.—Carnations are liable to a number of diseases, the more common and troublesome being anthracnose, rust, blight or spot, and a disease caused by the punctures of minute insects. The anthracnose, which is caused by the fungus *Volutella*, is widespread and causes grayish-brown spots on the leaves. Later the stems are invaded by the parasite and the supply of nourishment for the plant cut off. Diseased cuttings will spread the infection, hence all such should be rejected. The rust is caused by *Uromyces caryophyllinus* and may be recognized by the blisters on the leaves. A diseased plant cannot be cured and should be dug out and destroyed. The spot, or blight, is due to the fungus *Septoria dianthi*. It may be recognized by the light-brown spots, which later bear black dots near their centre. The stems also are attacked, and the plant is unable to perform its proper functions. A bud rot due to *Sporotrichum poae*, wilt due to *Fusarium* (sp.), and a root rot caused by *Corticium vagum solani* often cause losses. The popular names of these diseases are sufficient for their identification. In combating carnation diseases greenhouse management is of prime importance. If the soil is sterilized and attention given to ventilation and watering, much loss may be avoided. Where anthracnose, rust, and leaf spot become troublesome, spraying with Bordeaux mixture or other fungicides may be practiced to advantage. The disease caused by insect punctures may be recognized by the pellucid spots in the leaves. The name "stigma nose" has been lately given it. Anything keeping thrips, etc., in check will prevent the disease. Great variation in liability to all the diseases is noticed in different varieties.

CARNAUBA (kār-nou/bá) **PALM** (Brazilian), or **CARANAIBA PALM** (*Copernicia cerifera*). A very beautiful species of South American palm. It ranges from the northern parts of Brazil to Argentina, and in some places forms vast forests. It attains a height of 20 to 40 feet, with a diameter of 8 inches; its timber is valuable, is used in Brazil for a great variety of

purposes, and is exported for veneering. The fruit is black and about the size of an olive; it is sweet and is eaten both raw and prepared in various ways. Scales of wax cover the under side of the young leaves and drop off when shaken. Being collected in this way, the wax is melted into masses and is often used to adulterate beeswax. It is exported and used in the manufacture of candles. Starch is obtained from the stems of the trees, and sugar from the sap. The fibres obtained from the leaves are valuable, being used for cordage, mats, hats, etc. The tree withstands drought to a remarkable degree and is said to flourish on slightly saline soil. It is hardy only in the warmest parts of the United States.

CARNÉ, kār'ná', **LOUIS MARCIEN**, COUNT DE (1804-76). A French publicist, born at Quimper. In 1839 he was elected to the Chamber of Deputies, and, though opposed to Guizot's foreign policy, he accepted the presidency of the Commercial Department of Foreign Affairs in 1847, but lost this post after the Revolution of 1848. He became a member of the Academy in 1863. Carné was a frequent contributor to the *Revue des Deux Mondes* and other journals. Of his books the best known are *Vues sur l'histoire contemporaine* (2 vols., 1833); *Du gouvernement représentatif en France et en Angleterre* (1841); *Etudes sur les fondateurs de l'unité française* (2 vols., 1856); *Etudes sur l'histoire du gouvernement représentatif en France, de 1789 à 1848* (2 vols., 1855); *L'Europe et le Second Empire* (1865); *Les états de Bretagne et l'administration de cette province jusqu'en 1789* (2 vols., 1868); *Souvenirs de ma jeunesse* (1872).

CARNEADES (Gk. *Karpedōns*) (c.214-129 B.C.). A famous Greek philosopher, the founder of the New Academy. He was born at Cyrene, in Africa, and studied in Athens under Diogenes the Stoic, but attached himself to the Academy and opposed the dogmatism of the Stoa. He held that probability, which alone is attainable in knowledge, is a sufficient guide for life, for the common agreement in men's sensations and experiences must represent in some degree the truth. He was thus largely in harmony with Arcesilaus. In 155 B.C. he was sent with the Stoic Diogenes and the Peripatetic Critolaus on an embassy to Rome, where he attracted great attention by his eloquence. He argued before Galba and Cato the Censor in praise of justice, and the next day undertook to disprove his arguments of the previous day and so to establish his doctrine of the uncertainty of knowledge. To Cato such intellectual jugglery seemed dangerous, and he therefore had the Ambassador dismissed, that the Roman youth might not be corrupted. Consult Hicks, *Stoic and Epicurean* (New York, 1910). See NEW ACADEMY.

CARNEGIE, kār-nég'ī. A borough in Allegheny Co., Pa., 5 miles (direct) southwest of Pittsburgh, on the Pittsburgh, Cincinnati, Chicago, and St. Louis, the Pittsburgh, Chartiers, and Youghiogheny, and the Wabash Pittsburgh Terminal railroads (Map: Pennsylvania, A 6). The Carnegie library, Elks Home, high school building, and St. Paul's Orphan Asylum are noteworthy features. Carnegie is an important coal-mining centre, but is chiefly noted for its extensive steel-manufacturing interests. There are also lead works and manufactories of stoves and granite ware. The borough was formed in 1894 by the consolidation of Chartiers and Mansfield. It is governed by a burgess, elected every

CARNATIONS, ETC.



1. CASSAVA or MANIOC (*Manihot utilisima*).
 2. CARNATION (*Dianthus Caryophyllus*).
 3. SENNA (*Cassia* sp.).

4. CALAMITIES AS RESTORED.
 5. CARDAMON SEED (*Elettaria Cardamomum*)
 6. CASHEW NUT (*Anacardium occidentale*).

three years, and a unicameral council. Pop., 1900, 7330; 1910, 10,009; 1920, 11,516.

CARNEGIE, kâr-nég'ĭ, **ANDREW** (1835-1919). An American manufacturer and philanthropist, born in Dunfermline, Fifeshire, Scotland. He came to the United States in 1848 and worked as a weaver's assistant in a cotton factory at Allegheny, Pa., for little more than one dollar a week. At the age of 14 he became a messenger boy in the Pittsburgh (Pa.) office of the Ohio Telegraph Company. He soon learned telegraphy, entered the service of the Pennsylvania Railroad, and received a position as a telegraph operator. He advanced by successive promotions until he was superintendent of the Pittsburgh division. His interest in the organization of the Woodruff Sleeping Car Company laid the foundation of his fortune, and careful investments in oil lands near Oil City, Pa., increased his means. During the Civil War he rendered valuable services to the War Department as superintendent of military railroads and government telegraph lines in the East. After the war he entered actively into the development of ironworks of various kinds, and established at Pittsburgh the Keystone Bridge Works and the Union Iron Works. In 1868 he introduced into this country the Bessemer process of making steel. In 1888 he was the principal owner of the Homestead Steel Works and had a controlling interest in seven other large steel plants. His interests were consolidated in 1899 in the Carnegie Steel Company, which was merged into the United States Steel Corporation in 1901, when he retired from business.

Mr. Carnegie's benefactions have exceeded in amount those of any other American. In 1912 alone he gave \$130,403,000. Among his donations may be mentioned: to the Carnegie Institute of Technology (q.v.), Pittsburgh, \$10,000,000; to the Carnegie Foundation for the Advancement of Teaching (q.v.), \$15,000,000; (for his library benefactions, see **LIBRARIES**;) to universities of Scotland, \$10,000,000; to the fund for the benefit of the employees of the Carnegie Steel Company, \$5,000,000. In 1902 he gave \$10,000,000 (more than that amount since) to found the Carnegie Institution (q.v.) of Washington, D.C. In 1904 Mr. Carnegie established what has been termed the "Hero fund," of \$5,000,000. (See **CARNEGIE HERO FUND COMMISSION**.) For the United Kingdom he established a hero fund in 1908. He built a Palace of Peace for the International Court of Arbitration at The Hague, besides creating (1910) the \$10,000,000 Carnegie Endowment for International Peace (q.v.); and he built a home for the International Bureau of American Republics in Washington, D. C. In 1912 he announced that he had given all his fortune except \$25,000,000 to the Carnegie Corporation (organized in New York, Nov. 10, 1911). He was lord rector of St. Andrews University in 1901, 1902, and 1906, and of Aberdeen University in 1912. Mr. Carnegie's publications include: *An American Four-in-Hand in Britain* (1883); *Round the World* (1884); *Triumphant Democracy* (1886); *The Gospel of Wealth* (1900); *Empire of Business* (1902); *James Watt* (1905); *Problems of To-Day* (1909). Consult Alderson, *Andrew Carnegie: The Man and his Work* (New York, 1902).

CARNEGIE ENDOWMENT FOR INTERNATIONAL PEACE. A fund created by gift of Andrew Carnegie with an endowment of

\$10,000,000, the income of which is to be expended for the hastening of the abolition of international war. The organization of the endowment was formally effected Dec. 14, 1910, when the control of the fund was vested in a board of trustees under the presidency of Elihu Root. The formulation of a definite programme was left to the discretion of the trustees. The work of the endowment is organized under three divisions: the Division of Intercourse and Education, the Division of Economics and History, and the Division of International Law, under the directorship, respectively, of President Nicholas Murray Butler, Professor John B. Clark, and Dr. James Brown Scott. The Division of Intercourse and Education maintains, at the various capitals, agencies for the gathering of information with respect to international policies, and undertakes the work of promoting international good will. The division has arranged for the exchange of eminent scholars and men of letters between the several nations, and has interested itself in the propaganda for international peace through organizations already existing. It has been the aim of the endowment not to supplant such organizations, but to support them in their activities and to bring about more thorough coöperation between them. The American Peace Society, reorganized so as to serve as a representative of all the peace societies of the United States, receives from the endowment a liberal subvention, with which to assist its constituent societies in their work. Foreign peace societies are also subsidized through the Bureau International Permanent de la Paix at Bern and the Office Centrale des Associations Internationales at Brussels. A number of publications, both American and foreign, receive subventions from the endowment. Direct propaganda by the endowment is carried on through the Conciliation Internationale, with headquarters at Paris (American branch, the American Association for International Conciliation).

The Division of Economics and History has for its field an investigation of the conditions, political, social, and economic, having a bearing upon questions of peace and war. The programme of the division was worked out at a conference of scholars held at Bern in August, 1911. Arrangements were made for a large number of studies, to be conducted in the several countries by competent resident scholars. These studies are designed to furnish a solid basis for future propaganda work of the endowment.

The Division of International Law is intended to deal with the legal elements in international relations. Its work is primarily that of research into the principles of the existing body of international law, with a view to extending their application to an increasing range of international disputes. A further object of the division is the elaboration of programmes for submission to future Hague conferences. The division seeks to stimulate a broader interest among the legal profession in questions of international law. Consult *Year Books of the Endowment* (Washington, 1911 et seq.). See **WORLD PEACE MOVEMENT**.

CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING. A corporation chartered in 1906 primarily to administer a fund transferred to five trustees in 1905 by Andrew Carnegie for the purpose of providing retiring allowances for the teachers in universities, colleges, and technical schools in

the United States, Canada, and Newfoundland. The fund consisted of \$10,000,000 of 5 per cent first mortgage bonds of the United States Steel Corporation, to which Mr. Carnegie in 1908 added another \$5,000,000 so that state and colonial institutions of the same standing as the above might be included. Colleges and universities which desire to be placed on the list of institutions to whose teaching staff pensions may be granted must meet certain requirements of educational standard, administration, and endowment. Hence the foundation, while established to administer the pension fund, has in the short period of its existence exercised an all-powerful influence on institutions of higher learning. The standards of the entrance requirements have thus been raised, and the functions of college and university have been defined; restrictive sectarian or denominational tests and control debar an institution from being placed on the accepted list. Each annual report takes up some educational topic of general and national interest for discussion. Among these have been the following topics: college entrance requirements and the relations of college and secondary schools; standards in professional education; college advertising; education and politics; sham universities, etc. Considerable influence has also been exercised through its special bulletins, the most important of these being the bulletins on Medical Education in the United States and Canada (1910), and Medical Education in Europe (1912), which have already produced vital reforms in the professional preparation of doctors in this continent. Similar reports are to be made in other branches of professional training. The foundation also conducted in 1913 a survey of educational conditions in Vermont and formulated a scheme for a reconstruction of the system. The exchange of secondary school teachers between the United States and Prussia is another of the activities undertaken by the foundation. Fruitful work in the interests of educational progress is promised as a result of a further grant from Mr. Carnegie of \$1,250,000 for the establishment of a division of Educational Research.

The administrative officers of the foundation are Henry S. Pritchett, president; Robert A. Franks, treasurer; and Clyde Furst, secretary.

CARNEGIE HERO FUND COMMISSION.

A body formed in 1904 for the administration of a fund of \$5,000,000 given by Andrew Carnegie. The general purpose of the fund is to aid financially, until able to return to work, those following peaceful vocations who have been injured in heroic efforts to save human life. In case of death, the widow and children or other dependents are to be provided for until the wife remarries and the children reach a self-supporting age. The commission is also permitted to grant sums of money to such persons as they select for heroic deeds, each case to be judged on its merits. A medal which recites the heroic deed it commemorates is given to hero, widow, or next of kin. The field embraced by the fund is the United States, the Dominion of Canada, the Colony of Newfoundland, and the waters thereof. From the foundation of the fund to the beginning of 1914 about 750 medals had been awarded. In most cases these were accompanied by gifts of money. Of the medals 15 were gold, 274 silver, and 434 bronze. The commission has also contributed liberally in cases of disaster. These have included the

California earthquake, the Monongah mines disaster of Dec. 6, 1907, and several other mine disasters. The total funds distributed in pecuniary awards up to Jan. 31, 1913, was \$1,045,503. Of this amount \$671,041 included payments and pensions to heroes and their dependents, \$174,462 went to funds for relief of sufferers from disasters, and \$200,000 for special purposes. The latter includes appropriations to the Carnegie Institute at Pittsburgh. In addition to the Carnegie Hero Fund of America, Mr. Carnegie has established similar funds in Great Britain and Ireland, France, Germany, Belgium, Netherlands, Sweden, Norway, Switzerland, Italy, and Denmark.

CARNEGIE INSTITUTE OF TECHNOLOGY.

An institution for technical education, founded at Pittsburgh, Pa., in 1900, by Andrew Carnegie. Until 1912 it was known as the Carnegie Technical Schools, but in that year was incorporated under its present title. Mr. Carnegie's original gift for the foundation of the institute was \$1,000,000, but from time to time, as demands rose, he increased his benefactions until in 1913 they had reached a total of \$4,000,000 for buildings and equipment, and \$7,000,000 for endowment. The institute is located on a 32-acre site in Schenley Park, 3 miles from the business district of Pittsburgh. The site was a gift from the city. In 1914 eight buildings had been completed with a terraced campus in the centre. This represents only a portion of the ultimate building programme. The institution opened for actual work in October, 1905, with 765 students. The enrollment for 1912-13 was 2798 students from 39 States and 13 foreign countries. The officers of instruction and administration numbered 184. The institute consists of four separate schools, each with its own faculty, buildings, and student body. The School of Applied Science offers courses in chemical, civil, electrical, commercial, mechanical, metallurgical, mining, and sanitary engineering, leading to the degree of Bachelor of Science. There are in addition graduate courses. The enrollment in this school in 1912-13 was 752. The School of Applied Design offers courses in architecture, painting, decoration, illustration, and music. It is open to both men and women, and its courses lead to the degree of Bachelor of Arts. The enrollment in 1912-13 was 310. The School for Applied Industries offers industrial courses in machine construction, building construction, general equipment and installation, and also a course for the training of industrial teachers leading to the degree of Bachelor of Science in vocational education. Short courses of eight months are offered in machine shop, pattern making, mechanical drawing, electric wiring, plumbing, foundry, forging and bricklaying, for those who have had some experience in these trades. The enrollment in this school in 1912-13 was 1102. The Margaret Morrison Carnegie School for Women offers a regular day course embracing two years of general training with particular emphasis on home making, followed by two years of specialized training in household economics, secretarial work, costume economics, and home arts and crafts, leading to the degree of Bachelor of Science. There are also courses in the same subjects for the training of teachers. In this school the enrollment in 1912-13 was 574 students.

These four schools have also night courses in practically all of their subjects. The fees for

attendance at the institute are set at a nominal figure, as Mr. Carnegie's purpose in founding it was to place technical education of the most approved type within reach of students of moderate means. Tuition fees for day courses are \$20 a year for residents of Pittsburgh and \$30 for nonresidents. For the night courses the fees are \$5 a year for residents and \$7 for nonresidents. In connection with the institute there is operated a 750-acre engineering camp, called Camp Louise Carnegie. Here students in certain courses are stationed at different periods for their practical field work. The director of the institute is Arthur Arton Hamerschlag, Sc.D., LL.D.

CARNEGIE INSTITUTION OF WASHINGTON. An institution founded in 1902 at Washington, D. C., by Andrew Carnegie, "to encourage in the broadest and most liberal manner investigation, research, and discovery, and the application of knowledge to the improvement of mankind." At the time of its founding Mr. Carnegie gave to the board of trustees of the institution \$10,000,000. To this an addition of \$2,000,000 was made by him in 1907, and a further addition of \$10,000,000 in 1911, so that the endowment of the institution in 1913 was \$22,000,000. It was originally organized under the laws of the District of Columbia, and incorporated as The Carnegie Institution, but was reincorporated by an Act of Congress, approved April 28, 1904, under its present title. Under the articles of incorporation the institution was placed under the control of a board of 24 trustees, all of whom had been members of the original corporation. The trustees meet annually in December to consider the affairs of the institution in general, the progress of work already undertaken, the initiation of new projects, and to make the necessary appropriations for the ensuing year. During intervals between the meetings of trustees the affairs of the institution are conducted by an executive committee, chosen by and from the board of trustees, and acting through the president of the institution as chief executive officer.

To carry out the objects of its establishment three principal agencies have been developed. The first of these involves the formation of departments of research within the institution itself to attack larger problems requiring the collaboration of several investigators, special equipment, and continuous effort. The second provides means whereby individuals may undertake and carry to completion investigations not less important, but requiring less collaboration and less special equipment. The third agency, a division devoted to editing and printing books, aims to provide adequate publication of the results of research coming from the first two agencies, and to a limited extent also for worthy works not likely to be published under other auspices. These publications in 1914 numbered about 250 volumes. Copies of these are distributed freely to a selected list of libraries, and other copies are offered for sale at approximately the cost of publication.

The departments of research in the institution, organized up to 1914, are as follows: Department of Botanical Research (work carried on largely at Desert Laboratory, Tucson, Ariz.); Department of Economics and Sociology; Department of Experimental Evolution (laboratory at Cold Spring Harbor, N. Y.); Department of Historical Research; Department of Marine Bi-

ology (at Tortugas, Fla.); Department of Meridian Astrometry; the Mount Wilson Solar Observatory; Department of Terrestrial Magnetism and a Geophysical Laboratory (at Washington); and the Nutrition Laboratory (Boston). The president of the institution is Robert S. Woodward.

CARNEIA, kār-nē'ā or -nī'ā. See GREEK FESTIVALS.

CARNEIRO DE CAMPOS, kār-nā'rō dā kām'pōsh, JOSÉ JOAQUIM (1768-1836). A Brazilian politician, born at Bahia. He graduated at the University of Coimbra, Portugal, became a member of the Brazilian Constituent Assembly in 1823, and in the same year was appointed Minister of the Interior by the Emperor, Dom Pedro I. In 1826 he became Senator from the Province of Bahia and attained distinction as a debater on the important constitutional questions then under discussion. After the abdication of Dom Pedro I he was appointed one of the three members of the provisional regency.

CARNEIRO LEÃO, kār-nā'rō lā-oun', HONÓRIO HERMETO (1801-56). A Brazilian politician, born at Jacahy. He studied law at the University of Coimbra, attained distinction in his profession, was elected deputy in 1830, and in 1832-33 was Minister of Justice. From Jan. 20, 1843, to February, 1844, he was Prime Minister, and again held the same office from 1854 until his death. He became President of Rio de Janeiro in 1841 and of Pernambuco in 1849. For the greater part of his political career he was known as a leader of the so-called "New Conservative" party.

CARNELIAN, or **CORNELIAN** (Fr. *cornaline*, from Lat. *cornu*, horn. *Carnelian* is a form influenced by popular etymology with Lat. *caro*, flesh). A semitransparent variety of chalcedony, varying in color from a pale to a deep red. Inferior varieties are yellow and brown. The finest specimens are red and come mostly from Cambay and Surat in India. Red and yellow specimens of excellent quality have also been found at Tampa Bay, Fla., and near Cape Split, Nova Scotia. The carnelian from India is found in nodules of a blackish-olive color, which turn red only after exposure to the heat of the sun for two years, the color gradually becoming brighter and deeper. Artificial heat is sometimes substituted for that of the sun's rays, but with less satisfactory results, as the stones frequently crack and seldom acquire a brilliant lustre. The blood-red varieties were greatly valued by the ancients, who executed beautiful engravings in carnelian. Among the extant specimens of this kind may be mentioned the portrait of Sextus Pompeius in the Berlin collection, that of Helen in Vienna, and several in the British Museum. The carnelian is still used by lapidaries for seal rings.

CARNERI, kār-nā'rē, BARTHOLOMÄUS VON (1821-1909). An Austrian politician and writer, born at Trient. In 1870 he was elected to the Austrian Chamber of Deputies, where, as a prominent Liberal, he retained a seat until 1890. His publications include, besides some political monographs, *Gefühl, Bewusstsein, Wille* (1876); *Grundlegung der Ethik* (1881); *Der moderne Mensch* (5th ed., 1901); a translation of the *Divina Commedia* (1901), and a volume of *Gedichte* (1850).

CARNIFEX FERRY. A ferry across the Gauley River, near the mouth of Meadow River,

in Nicholas Co., W. Va. Near here, on Sept. 10, 1861, during the Civil War, an engagement occurred between a Federal force under General Rosecrans and a smaller Confederate force of 5000 under General Floyd. The former lost 17 killed and 141 wounded, while Floyd reported his casualties at only 20. During the night, however, Floyd retreated across the Gauley. Consult Johnson and Buel (editors), *Battles and Leaders of the Civil War*, vol. i (New York, 1887); *Official Records*, vol. v.

CARNIN (Lat. *caro*, flesh), $C_7H_5N_3O_2$. An organic substance allied to xanthine and found in meat extract, from which it may be obtained in the form of small, irregular crystals, sparingly soluble in cold, but readily in hot water. To prepare carnin from meat extract, the latter is dissolved and the solution is precipitated with a moderate quantity of baryta water, filtered, and basic acetate of lead is added to the filtrate; the lead precipitate is carefully extracted with hot water, and the solution thus obtained is treated with sulphuretted hydrogen to precipitate the lead; on filtering and concentrating the solution, carnin crystallizes out after some time. By the action of bromine water or of nitric acid, carnin may be readily converted into hypoxanthine, or sarkin, another compound contained in flesh.

CARNIO'LA (Ger. *Krain*). An Austrian crownland, bounded by Carinthia on the north, Styria on the northeast, Croatia on the east, southeast, and south, and Istria and Görz on the west (Map: Austria, D 4). It covers an area of 3843 square miles. The surface of Carniola is mostly mountainous. The northern part is traversed by a portion of the Karawanken chain, while on the west it receives the Julian Alps, which form the chief mountain chain of Kärntenland. Carniola belongs chiefly to the basin of the Save, which crosses its northern portion. In the south the main stream is the Gurk. There are not a few mountain caves and charming lakes. Although the proportion of productive land is very considerable (over 95 per cent), arable land is scarce (15 per cent) in Carniola on account of the numerous forests. The production of cereals is light. Vegetables constitute a very prominent element in the diet of the inhabitants. Silk, flax, and grapes are cultivated, and the exploitation of the forests is carried on extensively. The chief mineral is quicksilver, the mines of Idria being considered the most productive in Europe, with the exception of the Almaden mines in Spain. The other prominent minerals are iron and lignite. The chief manufacturing industries are the weaving of textiles and the making of leather goods. The trade is largely transit. Nearly 300 miles of railway lines, with Laibach, the capital, as the centre, facilitate the commerce of the crownland. The Diet of Carniola is composed of the Prince-Bishop of Laibach, 10 representatives of the landed aristocracy, 8 representatives of the towns and industrial centres, 2 representatives of the chamber of commerce of Laibach, and 16 representatives of the rural communities. In the Lower House of the monarchy Carniola is represented by 11 delegates, 2 from the landed aristocracy, 3 from the towns, 5 from the rural communities, and 1 elected by the people at large. For internal administration, the crownland is divided into 11 districts and the city of Laibach. There are about 380 elementary schools (283 Slav), at-

tended by over 75,000 children, or 89 per cent of the total school population.

Carniola had a population of 525,083 in 1910, against 508,150 in 1900, showing an increase of over 3 per cent for the decade. Nearly 94 per cent of the people are Slovenes, and the remainder consists of Germans, Serbo-Croatians, and Italians. Almost the entire population belongs to the Roman Catholic church. The capital, Laibach, had a population of 36,547 in 1910.

Carniola received its present name from the Slavonic Wends, who occupied the region after the fall of the Roman Empire. Charlemagne conquered it and gave it to the dukes of Friuli. From 972 it had margraves of its own, sometimes called dukes, who possessed, however, only a part of the country. On the extinction of the male line of the margraves, part of the territory passed to the dukes of Austria in the thirteenth century, and the remainder was acquired by them in the fourteenth. From 1809 to 1813 it formed part of the French Province of Illyria; in 1849 it became a crownland. See Dimitz, *Geschichte Krains* (4 vols., Laibach, 1874-76).

CARNIVAL (It. *carnevale*, or *carnovale*; probably from ML. *carnelevarium*, a release from the flesh. Incorrectly derived by popular etymology from Lat. *carni vale*, farewell to flesh, or It. *carne vale*, farewell, flesh). The days of revelry immediately before the beginning of Lent. The origin of this celebration is almost as obscure as the derivation of the name, for which several theories have been suggested, none of them entirely satisfactory. There is very little doubt that the custom is a survival of the old Roman festival of the Lupercalia (q.v.), which was held at the same season of the year, and that the Church, as in so many other instances (see BONFIRE), attempted to regulate and sanctify what it could not entirely suppress. The same spirit of compromise marked the attitude of the popes towards it throughout the Middle Ages. As secular rulers they were disinclined altogether to suppress an observance which promoted the material prosperity of the city; yet as pastors of souls they could not look with complacency upon the frequently unrestrained license attending its celebration. Several of the more spiritually minded popes made a practice of spending the season in strict retirement, to avoid witnessing the disorders which they could not altogether prevent: the time, which originally extended from the feast of the Epiphany (January 6) to Ash Wednesday, was restricted to eight and finally to three days; and a number of minute regulations have always reminded the populace of the existence of a superior authority. The celebration was usually suspended in the years of jubilee (q.v.), and the funds generally expended on the carnival diverted to the entertainment of needy pilgrims, the Jews being compelled to contribute to that purpose the tax in other years laid upon them for the purposes of the carnival.

In modern times Rome has continued the principal seat of these observances, although other Italian cities, notably Venice, have displayed great splendor, and the Parisians, never averse to an occasion for merrymaking, indulge in elaborate revels. A long-established custom in Paris has been to lead in the procession a fat ox (*bœuf gras*, whence *Mardi Gras*) followed in a triumphal car by a child called "the king of the butchers." Otherwise few of the traditional festivities are kept alive, except

the throwing of *confetti* or sweetmeats and flowers, the blowing of horns, the masked balls (see *MASQUERADE*), and the parades of allegorical chariots. In Italy, after the gayeties of the last day, *Mardi Gras*, the death of the carnival is symbolized by the burning of a huge effigy; and the crowds in the streets carry lighted tapers (*moccoletti*), each endeavoring to extinguish those of his neighbors and keep his own alight. In the United States the principal observance of *Mardi Gras* is that which has been carried out in New Orleans with great pomp and splendor since 1857. On this day the whole city is turned over to the rule of "King Rex, who passes through the streets escorted by his bodyguard, the mystic krewe of Comus," and various military and visiting organizations. In the evening occurs the great street pageant, in which are displayed elaborate tableaux, placed on moving forms and brilliantly illuminated. These represent noted scenes of history, poetry, or fiction, and are constructed at great expense and with artistic elegance. All the arrangements are under the control of societies composed of the best-known professional and business men of the city. Consult Rosières, *Histoire de la société française au moyen âge* (Paris, 1880), and Story, *Roba di Roma* (London, 1862). Byron's *Beppo* and the second part of Goethe's *Italianische Reisen* also contain vivid descriptions of the Italian carnival of a century ago. See *BLUE MONDAY*; *COLLOP MONDAY*; *SHROVE-TIDE*.

CARNIVORA (Lat. neut. pl., from *caro*, flesh + *vorare*, to devour). An order of mammals, more or less efficiently adapted for predaceous life, and including most of the forms popularly known as beasts of prey. Not all animals carnivorous in diet are carnivora in structure, for the dasyure or Tasmanian devil is a marsupial, and the blood sucking *Desmodus* is a bat. Nor are all the members of the order Carnivora in diet purely carnivorous, for the polar bears eat grass greedily, the rats are very partial to honey, and many forms eat fruits, berries, insects, mollusks, or crustaceans in a highly omnivorous manner.

The carnivora dwell in all parts of the world except New Zealand and Australia, where their work is done by flesh-eating marsupials. They vary in size from the ermine which one may hide in his pocket to bears that may weigh 2000 pounds; and are fitted for the chase of almost every variety of living creature, not even the oceanic birds (in their breeding places) being exempt from their ravages. They thus serve as a check upon the otherwise too rapid multiplication of herbivores, rodents, etc., which, relieved from them, would soon swarm excessively. Their relations with mankind are mainly those of enmity. He pursues some for sport, others for their fur, and others in order to get rid of neighbors dangerous to him or his domestic animals. The carnivora therefore disappear to a great extent in areas of civilization, the effect of which is felt in the increase of such pests as mice and gophers; but in some parts of the world wild beasts carry on even warfare, tigers and leopards alone killing many thousands of human beings and cattle annually. From this class, however, mankind has derived two of his most valued domestic pets—the dog and cat.

General Characters. The dentition of most carnivora is very characteristic. There are in

each jaw six pointed cutting teeth, two strong, sharp, recurved canines, and molar teeth often adapted for cutting. The skull is short and dense. The lower jaw moves up and down in a deep, transverse, semicylindrical groove, and there are deep hollows on the sides and prominent crests on the roof of the skull for the attachment of the powerful muscles which work the jaw. As one would expect in animals with vigorous habits of life, the convolutions of the brain and olfactory lobes are well developed. The toes are clawed, with more or less pointed nails. In contrast to herbivorous animals, the stomach is simple, and the cæcum is either absent or small. Vagrant, predatory habits, a flesh diet, fierce disposition, and high intelligence are ordinal characteristics. While most of the families are more abundant in the tropics than elsewhere, some are more generally inhabitants of temperate regions, and a few are especially common in the Far North.

Classification. Two suborders are distinguished—*Fissipedia*, the typical terrestrial carnivora, and *Pinnipedia*, the aberrant, aquatic forms. The second suborder, with its numerous adaptive characters, has doubtless been derived from the first, and is divided into three families, with about 50 species: 1. *Otariidæ*, or eared seals, nearest to the typical carnivora, and characterized by the presence of external ears. The sea lions, sea bears, sea elephants, fur seals, etc., are well-known examples. 2. *Trichechidæ* (or *Rosmaridæ*), the walruses (q.v.), of which only two species, or perhaps one with two geographical subspecies, are known, characterized by the prolongation of the upper canine teeth into two powerful tusks. 3. *Phocidæ*, or earless seals, characterized by the absence of external ears and the lack of tusks; there are about 10 genera and some 20 species.

Cuvier proposed to divide the typical carnivores into *Plantigrades*, walking on the entire sole (e.g., bears), and *Digitigrades*, walking on finger tips (e.g., cats); but these functional differences are rendered useless by the multitude of transitional links connecting them, and it is more accurate and useful to divide the order into three sections, represented familiarly by bear, dog, and cat, and technically known as *Arctoidea*, *Cynoidea*, *Æluroidæ*. The distinctions are based on certain features in the base of the skull, but are corroborated by other more general characteristics.

1. The *Arctoidea*, which are less specialized and nearest the aquatic suborder, are composed of six families, viz., the fur bearers (*Mustelidæ*), the bears (*Ursidæ*), the raccoons (*Procyonidæ*), and three small related families.

2. The *Cynoidea* resembles the *Arctoidea* in most respects, and are composed of the single family *Canidæ*—dogs, foxes, etc.

3. *Æluroidæ* are the most specialized of carnivores, represented by cats, civets, etc., of which there are six families. The whole order of Carnivora embraces about 300 living species.

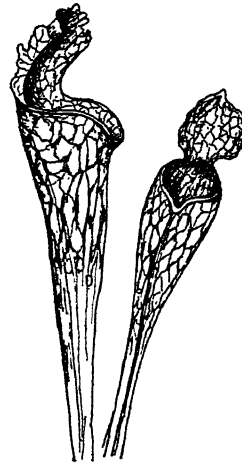
Pedigree and History. The fossil history of carnivora is of great interest, for not only have some remarkable forms like the sabre-toothed tiger (*Machærodus*) been unearthed, but the various families are linked together, as the cats and civets, by *Proiverra*, and the ancestors of at least the cats and the dogs are found in primitive generalized carnivores, such as *Miacis*, *Oxyænæ*, and *Arotocyon*. The group affords beautiful illustrations of increasing and of di-

vergent specialization, as illustrated in the passage from primitive forms to the lion on the one hand and to the seal on the other. As to the relations of the carnivora to other orders of mammals, speculation is rife, but firmly based conclusions are hard to find. Looking backward, some naturalists have discovered affinities with the marsupials; while others, looking forward, have, with more abundant evidence, regarded the primitive carnivores as ancestral to Insectivora, and through them to Cheiroptera. And now there seems to be some evidence of not very distant relationship between Carnivora and Primates.

Bibliography. Consult authorities referred to under MAMMALIA; BEAR; CAT; DOG; ETC.

CARNIVOROUS PLANTS. A peculiar group of plants, part of whose food consists of animals, especially insects, captured by various contrivances, hence called also "insectivorous plants," since the captured insects are used for food. Most of these plants live in undrained swamps where the soil is poor in nitrogen, and the capture of insects is one way of getting protein food without manufacturing it. At the same time the leaves of these plants are usually green, and therefore manufacture carbohydrate food. There are three conspicuous types of "insect-catching" plants. The pitcher plants (*Sarracenia*, *Nepenthes*, etc.) are so named because their leaves form tubes or urns of various kinds which contain water, and to these "pitchers" insects are attracted and then drowned. In some cases nectar is secreted around the mouth of the pitcher which attracts insects. Inside the pitcher, just below the rim, is a glazed zone, and below this another zone with thickly set downward-pointing hairs, so that when a fly slips upon the glazed zone and plunges into the liquid at the bottom of the pitcher, the zone of downward-pointing hairs effectively prevents any escape. The sundews (*Drosera*) are among the most common of the insectivorous plants, the leaves forming small

these glands excrete a clear sticky fluid which clings to them like dewdrops, and which, not being dried up by the sunlight, has suggested the name "sundew." If an insect alights on the leaf, or even brushes past it, it is held fast by the sticky hairs, which begin to curve inward, and presently press the victim down upon the surface of the blade, where it is digested. The Venus-fly-trap (*Dionaea*) is one of the most remarkable of insect-trapping plants, being found only in certain sandy swamps near Wilmington, N. C. The leaf blade is constructed so as to work like a steel trap, the two halves snapping together and the marginal bristles interlocking like the teeth of a trap. This



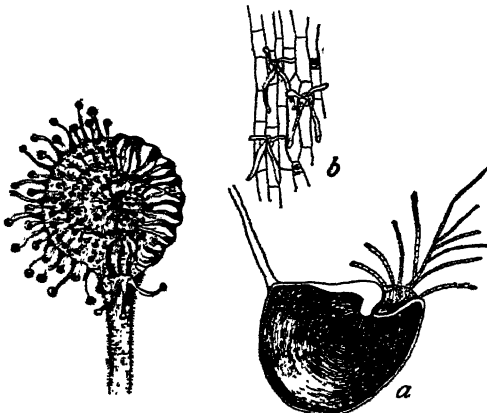
Pitcher-like leaves (ascidia) of the Pitcher Plant (*Sarracenia*). Insects are often present in the liquid within the ascidia.

trap is sprung by sensitive hairs, like feelers, that are developed on the leaf surface. [When one of these is

touched by a small flying or hovering insect, the trap snaps shut, and the insect is caught. In all of these cases a digestive fluid is excreted and the food material utilized. The most noteworthy single book upon this subject is Darwin, *Insectivorous Plants* (London, 1875). See DIONÆA; NEPENTHES.

CARNOCHAN, kār'no-kan, JANET (1839-). A Canadian educator and writer. She was born in Stamford, Ontario, and was educated at Niagara, where for many years she was a teacher in the high school. After resigning that position she devoted herself mainly to historical investigations in connection with the town of Niagara (formerly Newark and the earliest seat of government in Ontario) and the Niagara peninsula. In the course of these investigations she made many valuable contributions to the press. Chosen president of the Niagara Historical Society, she collected valuable relics of various sorts relating to the early history of the town and peninsula, and especially to the War of 1812. She was also active in procuring the erection of stones to mark historic places in the peninsula, and was principally concerned in the establishment of the Niagara Memorial Hall in 1907. Besides prose writings she published several poems.

CARNOCHAN, kār'no-kan, JOHN MURRAY (1817-87). An American surgeon, born in Savannah, Ga. He was educated at Edinburgh University and at the College of Physicians and Surgeons of New York, and in 1847 began practice in New York. Dr. Carnochan rapidly rose to the first rank among practicing physicians and surgeons and acquired great celebrity for the boldness and success of his operations, such as the removal of the lower jaw; the cure of elephantiasis by ligature of the femoral artery; excision of the ulna while preserving to the arm most of its functions; amputating the thigh at the hip joint, and particularly for removing, in case of neuralgia, the entire trunk



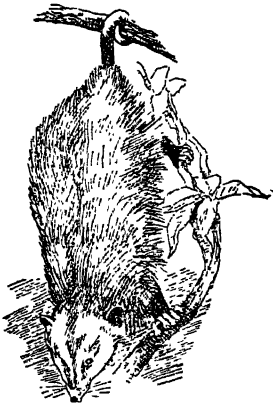
A leaf of the Sundew (*Drosera*), showing the tentacles which capture insects; the tentacles at the right illustrate how they bend in towards an insect which has alighted on the leaf.

a. A bladder of the Bladderwort (*Utricularia*). Insects are captured here after the fashion of an eel trap.

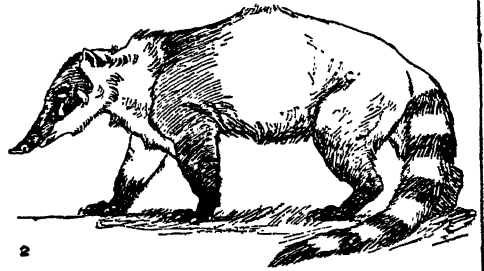
b. Hairs (supposedly with digestive functions) within the bladder of *Utricularia*.

rosettes upon the ground in swampy regions. The margin of the leaf is beset by prominent glandular hairs, and over the inner surface of the blade shorter hairs are scattered. All of

AMERICAN MINOR CARNIVORES



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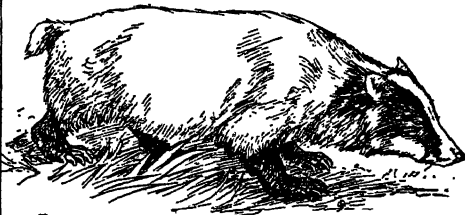
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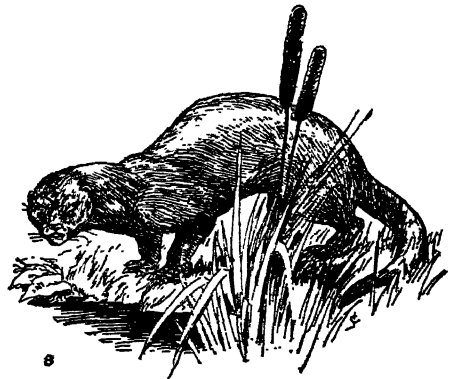
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1. OPOSSUM (*Didelphys Virginiana*).
2. RED COATI (*Nasua rufa*).
3. CACOMISTLE (*Bassariscus astutus*).
4. RACCOON (*Procyon lotor*).

5. SKUNK (*Mephitis mephitis*).
6. STRIPED SKUNK (*Spilogale putorius*).
7. BADGER (*Taxidea taxus*).
8. OTTER (*Lutra canadensis*).

of the second branch of the fifth pair of nerves. Dr. Carnochan added much to the renown of American surgery. He was professor of the principles and practice of surgery in the New York Medical College and health officer of the port of New York. Besides numerous monographs of value on subjects connected with his profession, he published *Treatise on Congenital Dislocations* (1850) and *Contributions to Operative Surgery* (1858 and 1877-86).

CARNOT, kâr'nô', LAZARE HIPPOLYTE (1801-88). A French politician and journalist, the son of the "Organizer of Victory." He was born at Saint-Omer, April 6, 1801. He studied for the law, but was debarred from practice for refusing to take the oath of allegiance to the Bourbons. Turning to journalism, he soon made a name for himself as a follower of Saint-Simon and his school, and became editor of *Le Producteur*, a radical journal of the day, but after the July Revolution forsook Saint-Simonism to a certain extent. In 1839 he entered the Chamber of Deputies as a representative from Paris and remained until 1848, voting with the radical extreme Left. After the February Revolution he accepted the post of Minister of Public Instruction, but held it only a few months. Elected to the Legislative Assembly in May, 1850, he took his place among the Republicans opposed to the schemes of Louis Napoleon. After the coup d'état of 1851 he refused to swear allegiance to Napoleon, and though several times elected to the Legislative Assembly, did not take his seat until 1864. In 1869 he was defeated in the elections by Gambetta and by Henri Rochefort, but in 1871 he was chosen deputy from Seine-et-Oise. Made a life senator in 1875, Carnot took a prominent part in the debates of the Upper House, and spoke for the last time in 1888, a few weeks after his son Sadi had been elected President of the Republic. He died March 16, 1888. He was the author of numerous magazine articles and reviews, the most important being *Exposé de la doctrine Saint-Simonienne* (1830); *Mémoires sur Carnot, par son fils* (2 vols., 1861-64); *La Révolution française* (2 vols., 1867); *Lazare Hoche* (1874); and, with M. d'Angers, *Mémoires de Bertrand Barère* (4 vols., 1842-43). For his biography, consult the *Proceedings* of the Académie des Sciences, Morales et Politiques (Paris, January, 1894); also Hubbard, *Une famille républicaine: les Carnot* (Paris, 1888).

CARNOT, LAZARE NICOLAS MARGUERITE (1753-1823). A French strategist and mathematician. He was born at Nolay, and became, in 1791, a member of the Legislative Assembly from Pas-de-Calais. In the Convention he voted for the death of Louis XVI. He was elected to the Committee of Public Safety, intrusted with the chief direction of military affairs, and greatly contributed to the success of the French arms. He displayed extraordinary ability in this position, alike as a strategist and as an organizer. He created 14 armies, placed them under the command of competent generals, and inspired the troops with an ardor which made them irresistible. Though he endeavored to restrict the power of Robespierre, he was impeached with others, after the Reign of Terror, but the charge was dismissed. Carnot became a member of the Directory in 1795, but having opposed the extreme measures of Barras, his colleague, he was suspected of being a Royalist and sentenced to deportation in 1797. Having escaped to Germany, he wrote his famous defense, in which he

laid bare the character of his associates in the Directory. The Eighteenth Brumaire brought him back to Paris. Bonaparte made him Minister of War in 1800. In this office he helped, by his energy, skill, and fertility of administrative resource, to achieve the brilliant results of the Italian and South-German campaigns; so that to him was given the name of "Organizer of Victory." Being unable to agree with Bonaparte, he resigned in the same year. In 1802 he became a member of the tribunate, in which capacity he voted against the establishment of the consulate for life and particularly against an empire. When the tribunate was abolished, he retired to private life and devoted himself to his studies. But when fortune ceased to favor Napoleon he placed his services at his command in 1814. The command of Antwerp was given to him, and the city was heroically defended. During the Hundred Days he held office as Minister of the Interior. The title of Count was conferred upon him, but he never bore it. After the second restoration he withdrew to Warsaw, and from thence to Magdeburg, where he died, Aug. 3, 1823. Carnot's chief contribution to mathematical science is a class of general theorems on the projective properties of figures, which later formed the basis for the important works of Poncelet and others. Among his numerous writings on mathematics and military tactics are: *Essai sur les machines en général* (1786); *Réflexions sur la métaphysique du calcul infinitésimal* (1797); *Géométrie de position* (1803). Consult Arago, "Eulogy of Carnot," in vol. i of Arago's *Œuvres complètes* (Paris, 1854).

CARNOT, MARIE FRANÇOIS SADI (1837-94). President of the French Republic from 1887 to 1894. He was the son of Lazare Hippolyte Carnot and was born at Limoges, Aug. 11, 1837. He received a scientific education, became an engineer, and advanced rapidly in his profession, acquiring a considerable reputation as the constructor of the large tubular bridge at Colonges-sur-Rhône. In 1870 he was stationed as government engineer at Annécy, and in 1871 Gambetta, who was then Minister of the Interior, made him the Prefect of the Department of Seine-Inférieure. In this capacity he rendered important services to the government, but after the capitulation of Paris resigned his office and sat as a deputy from Côte d'Or in the National Assembly. There he took a prominent part in all discussions concerning the future form of government for France, voting always with the Republicans of the Left, for whom he acted as secretary. He became a member of the new Chamber of Deputies in 1876, and in 1877 was Secretary to the Chamber, besides being prominent in connection with the Public Works Committee. In 1880-81 he was Minister of Public Works, and held the same office again in 1885, in the Brisson ministry, in which he later acted as Minister of Finance. On Dec. 3, 1887, he was elected to succeed Grévy as President of the Republic. In the performance of the high functions of this office Carnot won the respect of all by his tact and ability. He passed unscathed through the Panama disclosures of 1892. His term of office was almost over when he was stabbed by an Italian anarchist named Caserio, in Lyons, and died the next day, June 25, 1894. He was succeeded as President by Casimir-Périer. Consult Hubbard, *Une famille républicaine: les Carnot* (Paris, 1888).

CARNOT, NICOLAS LÉONARD SADI (1796-

1832). A French physicist, to whose early researches and theories must be ascribed the beginning of the modern science of thermodynamics (q.v.). He was born in Paris, the son of Lazare Nicolas Marguerite Carnot. He entered the Polytechnic School in 1812, from which he passed into the corps of engineers, where he served until 1828. Working in this capacity, he had time and opportunity for scientific research, and in 1824 published his famous work, *Réflexions sur la puissance motrice du feu*, in which is described his cycle and reversible engine. Carnot's work was based on the theory that heat was a substance, "caloric," but so perfect was his reasoning that the theory required but few modifications to adapt it to the dynamical theory, which was later accepted, even by Carnot himself. According to Carnot, the amount of work done by a heat engine depends on the amount of heat transferred and the difference in temperature between the source of heat and the receiver; work can be done only when heat passes from a warmer to a colder body. This is, in substance, the second law of thermodynamics, enunciated by Clausius in 1850, which stated that heat cannot of itself pass from a colder body to a hotter one, nor can it be so made to pass without any inanimate material mechanism: and no mechanism can be driven by a mere simple cooling of any material object below the temperature of surrounding objects. In order to study the efficiency of the steam engine, Carnot devised a reversible engine where the amount of energy produced and heat applied could be investigated under ideal conditions. Carnot also appreciated the important principle now known as conservation of energy, stating that motive power is in quantity invariable in nature: it is, correctly speaking, never either produced or destroyed. Carnot's work was greatly extended and adapted to modern theories by Sir William Thomson (later Lord Kelvin), who published important papers in 1848 and 1849 which indicated that from these researches could be evolved the absolute thermodynamic scale of temperature. Carnot's great essay was printed in German, in *Ostwald's Klassiker*, No. 37 (Leipzig, 1892), and an English translation was made by Prof. R. H. Thurston, to which was appended an *Account of Carnot's Theory*, by Lord Kelvin (New York, 1890).

CARNUNTUM (Lat., from the Celtic). An ancient town in Upper Pannonia, on the Danube, a few miles east of Vienna, founded by the Celts, but at an early period a Roman post. Marcus Aurelius resided here in 172-175, during his wars with the Marcomanni. In the fourth century Carnuntum was destroyed by German invaders. It was afterward rebuilt, but was finally destroyed in the Magyar wars of the Middle Ages. There are numerous ruins from Roman days.

CARNUTES. A people of central Gaul, between the Seine and the Loire. In 52 B.C. they joined Vercingetorix against Cæsar and sent 12,000 men to the aid of Alesia. Cæsar burnt their chief town, called Cenabum, or Genabum. (See ORLÉANS, France.) Augustus made the Carnutes a *civitas fœderata*, an allied state, permitting them to retain their own institutions. The name "Carnutes" was given also to their chief city. (See CHARTRES.) Consult Holmes, *Cæsar's Conquest of Gaul* (2d ed., Oxford, 1911).

CARNUTUM CIVITAS. See CHARTRES.

CARO, kâr'ô. A village and the county seat of Tuscola Co., Mich., 26 miles (direct) east by south of Bay City, on the Cass River, and on the Michigan Central, and the Detroit, Bay City, the Western railroads (Map: Michigan, F 5). It is in an agricultural region, adapted particularly to the cultivation of sugar beets and beans, but has industrial interests represented by flour mills, grain elevators, a large beet-sugar refinery, lumber mills, brick and tile works, foundries and machine shops, fireless-cooker, horse-collar, and telephone factories, marble works, etc. Pop., 1890, 1701; 1900, 2006; 1910, 2272.

CARO, kâr'ô, ANNIBALE (1507-66). An Italian poet, best remembered for his felicitous translation of Vergil's *Æneid*. He was born at Civita Nuova, in Ancona; became at an early age tutor to the sons of Luigi Gaddi, in Florence; and in 1543 entered the service of Pier Luigi Farnese, nephew of Paul III, who sent him on numerous embassies, among others to the Emperor Charles V in Flanders. After the death of Pier Luigi, Caro served successively the Duke Ottavio Farnese and the latter's brothers, the cardinals Ranuccio and Alessandro, with whom he remained until his death, in 1566. Caro numbered among his friends many of the best-known men of letters of his day—Molza, Salviati, Vasari, and Tansillo. He was an accomplished letter writer, and his *Lettere familiari* are not only of great historical interest, but have often been reprinted as models of style. Important for its stimulating effect on interest in questions of literary criticism and philology was Caro's polemic with the celebrated Lodovico Castelvetro, who had criticized one of Caro's panegyrics. This bitter quarrel, resulting in the death of one man and in Castelvetro's banishment, gave rise to Varchi's *Ercolano* and to Castelvetro's famous *Correzioni* thereto. Caro's *Apologia* in this polemic well illustrates the spirit of scholarship at the time and is interesting as a sample of Italian eloquence. Caro's excellent translation of the *Æneid* was begun, he tells us, "in jest, and only as an experiment," but he continued it for the pleasure of "making trial of the language in comparison with Latin." The translation, which remained unfinished, is rather a skillful paraphrase than a faithful rendering; but, like all his writings, bears the stamp of a cultured and polished style. The best editions of Caro's works were published in Venice (1757), in Milan (1806), and a volume of selected works appeared in Florence (1864).

CARO, kâr'ô, ELME MARIE (1826-87). A French philosopher, born in Poitiers. He graduated at the École Normale in 1848, and was appointed professor of philosophy at the Sorbonne in 1864, and elected to the Académie in 1874. His writings, many of them in opposition to modern positivism, comprise: *Études morales sur le temps présent* (1855; 3d ed., 1875); *L'Idée de Dieu et ses nouveaux critiques* (1864; 7th ed., 1883); a study of Hartmann, Schopenhauer, and Leopardi in *Le pessimisme au XIXe siècle* (1878); *Mélanges et portraits* (1888). His wife, PAULINE CASSIN, was a well-known novelist and wrote, under the pseudonym "P. Albane," *Le péché de Madeleine* (1865).

CARO, kâr'ô, JAKOB (1836-1904). A German historian. He was born in Gnesen, and after studying in Berlin and Leipzig was professor of history in Jena until 1869, when he accepted a similar chair at the University of Breslau. His

publications, which deal chiefly with Polish and Hussite history, include the continuation of Röppl's *Geschichte Polens* (3 vols., ii-v, 1863-88), published in Ukert and Heeren's *Geschichte der europäischen Staaten; Das Interregnum Polens im Jahre 1587, und die Partekämpfe der Häuser Zborowski und Zamojski* (1861); edited *Liber Cancellariæ Stanislai Ciolek, Ein Formelbuch der polnischen Königskanzlei aus der Zeit der hussitischen Bewegung* (2 vols., 1871-74); *Aus der Kanzlei Kaiser Sigismunds* (1879); and *Beata und Halszka, Eine polnisch-russische Geschichte aus dem 16. Jahrhundert* (1883).

CAR/OB, **ALGAROB**, **SAINT JOHN'S BREAD**, or **LOCUST TREE** (It. *carrubo*, from Ar. *kharrûb*, bean pods) (*Ceratonia siliqua*). A tree of the family Leguminosæ, a native of the countries around the Mediterranean Sea, in size and manner of growth much resembling the apple tree, but with abruptly pinnate, dark, evergreen leaves, which have two or three pairs of large oval leaflets. The flowers are destitute of corolla; the fruit is a brown, leathery pod 4 to 10 inches long and an inch or so wide, a little curved, and containing gummy pulp, of an agreeable, sweet taste, in which lie a number of shining brown seeds, somewhat resembling small flattened beans. The seeds are bitter and of no use, but the sweet pulp renders the pods an important article of food to the poorer classes of the countries in which the tree grows, as they contain as much as 60 per cent of sugar. They are very much used by the Moors and Arabs. They are also valuable as food for horses and cattle, for which they are much employed in the south of Europe, and have of late years begun to be extensively imported into Great Britain under the name of locust beans, or St. John's bread. The Arabs make of the pulp of the carob a preserve like tamarinds, which is gently aperient, and also a kind of liquor. The carob tree is too tender for the climate of Great Britain. At the California Experiment Station the tree is highly thought of for its shade. It grows well in dry, rocky situations and is considered a valuable acquisition. It will not stand frost. The wood is hard and much valued, and the bark and leaves are used for tanning. The locust tree of America is quite distinct from this. In Hawaii the mesquite tree is called "algaroba." In California this tree is frequently used for hedges. See **CARAT**.

CAR/BA. See **JACARANDA**.

CAR/OL (OF. *carole*, from Bret. *koroll*, dance, Gael. *carull*, melody, from *car*, bar of music, Ir. *car*, a turn, ultimately, perhaps, connected with Ir. *carr*, cart, Lat. *currus*, cart). In the stricter sense, a popular religious song intended to form part of the rejoicings connected with the great Christian festivals. The kinship of the earlier English carols with similar French compositions is evidenced by the frequent recurrence in them of the refrain "Nowell," a variant of the Fr. *Noël*, Christmas (Lat. *natale*, birthday); though they had a wide popularity in the Middle Ages on the continent of Europe, they are especially associated with English tradition. Their use seems to have been at its height under the Tudors; the universal familiarity with them is shown by the specific prohibition in 1525, when Henry VIII lay seriously ill, of "carols, bells, or merry-making." In 1562 license was given to Thomas Tysdale to print "certayne goodly Carowles to be songe to the glory of God." The Puritans, in their general

onslaught on the observance of Christmas, when holly and ivy were made seditious badges, attempted to abolish them; but they came back with the Restoration, and in 1661 appeared *The New Carols for the Merry Time of Christmas, to Sundry Pleasant Tunes*. To this day it is the custom in many parts of England for troops of men and boys, known as "waits," to go about the villages for several nights before Christmas, singing carols in the open air. As a rule, the best carols are the oldest, although one of the most popular, "While Shepherds Watched their Flocks by Night," was composed in 1703 by no better a poet than Nahum Tate, and the ancient spirit has been successfully caught in recent times by Swinburne, William Morris, and John Mason Neale. The older carols, usually set to pleasing and not difficult melodies, have the characteristics of popular poetry in general. They are simple, picturesque, and often childlike in their naïveté to the point of seeming to persons of less unsophisticated training to border on irreverence. A manuscript of the fifteenth century now in the British Museum (ed. Thomas Wright, London, 1847) contains a number of the most famous early carols. The best collection, however, of both the ancient and modern types is *Christmas Carols, Old and New* (London, 1874), the words edited by H. R. Bramley, and the music by Sir John Stainer. An excellent collection is that of Martha E. Rickert, *Ancient English Christmas Carols, 1400-1700* (New York, 1910). Consult E. Duncan, *The Story of the Carol* (London, 1911).

CAROLAN, *kär'ô-lan*, or **O'CAROLAN**, *ô-kär'ô-lan*, **TURLOGH**. See **O'CAROLAN**, **TURLOGH**.

CAROLINA, *kär'ô-lē'nā*, **LA**. The capital of a district in the Province of Jaén, Andalusia, Spain, on the southern range of the Sierra Morena, 36 miles north-northeast of Jaén. It has lead and silver mining industries, vineyards, and olive plantations. The inhabitants, descendants of South Germans, who settled here in 1767 under the auspices of Count Olavides, the favorite of Charles III, exhibit an interesting assimilation, their origin being easily discernible, although the Teutonic language has been replaced by the Spanish. Pop., 1900, 9756; 1910, 11,943.

CAROLINA, *kär'ô-lē'nā*, **MARIA** (1752-1814). A daughter of Francis I, Emperor of Germany, and Maria Theresa of Austria, and Queen of Naples by her marriage with Ferdinand IV in 1768. She had great influence with the King, had Sir John Acton appointed Prime Minister in place of Tanucci in 1784, and caused the King, in 1798, to join the coalition against France, the consequence of which was the marching of the French upon Naples (1799) and the flight of Ferdinand and Carolina. After returning to Naples Carolina again conspired against Napoleon, and, with her husband, was, in 1806, dethroned and succeeded by Joseph Bonaparte. She died in Vienna.

CAROLINA (*kär'ô-lē'nā*) **ALLSPICE**. See **CALYCANTHUS**.

CAROLINA PINK. See **SPIGELIA**.

CAROLINA TEA. See **YAPON**.

CAROLINA TOWN. A town of Porto Rico in the Municipality of Carolina, 17 miles southeast of San Juan (Map: Porto Rico, F 2). Its climate and sanitary conditions are exceptional, and there are public schools, two churches, and a city hall. The neighboring country is taken up with sugar estates and dairy farms, and it is

a terminal of the railroad. Pop., 1899, 2177; 1910, 3244.

CAROLINE, THE. An American vessel, the seizure and destruction of which, off Grand Island, by a party of Canadians, on Dec. 29, 1837, during the rebellion in Upper Canada, threatened to cause a war between the United States and Great Britain. The steamer had been used for carrying supplies to a party of insurgents on Navy Island, and Great Britain asserted in 1840 that its destruction was a legitimate act of war, while the United States repeatedly demanded redress on the ground that the Canadians had invaded its territory in time of peace. The difficulty came to a crisis in the course of the same year when a Canadian named McLeod, who had boasted of participating in the affair, was tried in New York. The British ministry threatened war in case he were not released, but his trial was nevertheless continued, and his acquittal alone prevented serious trouble between the two governments.

CAROLINE, AMELIA ELIZABETH (1768-1821). Queen of George IV of England. She was the second daughter of Charles William Ferdinand, Duke of Brunswick-Wolfenbüttel, and Princess Augusta of Britain, sister of George III. She was born on May 17, 1768, and on April 8, 1795, was married to the Prince of Wales, who, with no love for his cousin, consented to the union for the sake of liquidating his debts. She soon complained of his intimacy with Mrs. Fitzherbert and Lady Jersey. The King sought to reconcile the royal pair; but after the birth of their daughter, Princess Charlotte, January, 1796, the Prince of Wales deserted his wife. She received public sympathy and support, especially when official attempts were made to discredit her. In 1814 she obtained leave to travel, and lived in Italy for some time, but acted imprudently in showing favor to her courier, Bergami, and his family. When her husband became King in 1820, she was offered an annuity of £50,000 sterling to renounce the title of Queen and live abroad; but she refused, and made a triumphal entry into London, whereupon the government instituted proceedings for divorce on a charge of adultery. Indiscreet conduct was proved; but the manner in which she had been used by her husband, and the splendid defense of Brougham, caused such a feeling in her favor that the ministry abandoned the divorce bill, after it had passed the House of Lords. She assumed the rank of royalty, but was repulsed from Westminster Abbey when she insisted on her right to coronation with her husband, July 29, 1821. Nine days afterward she died. In direct disregard of the King's desire, the funeral procession, on its way to Brunswick, where Caroline was buried, passed through the city of London; but not before lives had been lost in an encounter with the Life Guards at Hyde Park Corner. Consult: *Memoirs of Queen Caroline*, by Nightingale (London, 1820); Adolphus (London, 1821); Huish (London, 1821); Wilk (London, 1822); also Clerke, *Life of Her Majesty Queen Caroline* (London, 1821).

CAROLINE BOOKS (Lat. *Libri Carolini*). A work in four books, drawn up in 791 by the authority of Charles the Great, against the decrees of the Iconoclastic Council of 754 and of the Second Council of Nicaea in 787. The latter had been translated into Latin incorrectly, and the author of the Caroline Books supposed that

they ordered the same worship to be paid to the images as to the Trinity. The Caroline Books reject both iconoclasm and the worship of images. The author is unknown. Consult Hefele, *Conciliengeschichte*, vol. iii, bk. xx, chap. ii (2d ed., Freiburg, 1877).

CAROLINE ISLANDS. A group of small and widely scattered islands in the Pacific Ocean, extending from 0° 55' to 10° 6' N. lat. and from about long. 137° to about 164° E. (Map: Australasia, G 2); a German possession. They number about 525, including reefs and uninhabited rocks, and their area is estimated at 390 square miles. The larger islands have a considerable elevation; most of the rest are low, mainly of coral formation, and their soil is not above the average in fertility. The main islands of the group are Ruk, or Hogolu, Ponape, Kusaie, and Uap (Yap); these together cover 307 square miles. The chief product is copra, while some of the islands also yield shells. The commerce is mostly in the hands of the German Jaluit Company, which has stations on almost every important island. Administratively the group is a part of the German New Guinea Protectorate. The population of the Caroline Islands was estimated in 1911 at 55,000 and consists chiefly of Micronesians, with about 320 Europeans. Most of the natives have been converted to Christianity, the archipelago having early engaged the attention of the American Board of Commissioners of Foreign Missions. They are well developed physically and mentally, a little shorter than the eastern Polynesians, and dolichocephalic. Cyclopean stone walls are found on the islands of Tapak, Lele, and Ponape; the largest of these prehistoric structures is Nan Matal in Metalanim harbor on the east coast of Ponape. The stone structures of the Pacific are discussed in the article on Megalithic monuments (q.v.). The Carolines were discovered in 1527 by the Portuguese Diego da Rocha, visited in 1528 by Alvaro de Saavedra, who assumed possession for the King of Spain, and further explored in 1686 by the Spanish admiral Francisco Lazeano, who gave to the group its present name in honor of King Charles II. In the beginning of the eighteenth century, as a result of the final determination of a more northern course for the annual voyage of the galleon from Acapulco for Manila, the group was entirely abandoned by Spain, and it was not until the beginning of the nineteenth century that the existence of the Caroline archipelago was again brought to the attention of the civilized world by a number of scientific expeditions. At length German commercial interests became paramount in the Carolines, and the hoisting of the German flag over Yap in 1885 called forth the protest of Spain. A settlement reached in the same year, with the Pope as an arbitrator, recognized Spain's claim to the archipelago, but conferred special commercial privileges on Germany. In 1899 the Caroline, Pelew, and the Ladrone groups (except Guam) were ceded to Germany in consideration of the sum of 16,750,000 marks (about \$3,986,500). Consult: Christian, *The Caroline Islands* (London, 1899); Otto Finsch, *Karolinen und Marianen* (Hamburg, 1900); id., *Anthropologische Ergebnisse einer Reise in der Südsee* (Berlin, 1883); Furness, *The Island of Stone Money* (London, 1910); Salesius, *Die Karolinen-insel Jap* (Berlin, 1904).

CAROLINE MATILDA (1751-75). Queen of Denmark and Norway. She was the youngest

child of Frederick, Prince of Wales, and in 1766 married Christian VII, by whom she became the mother of Frederick VI. The King was a youth of feeble character and by self-indulgence had reduced himself almost to a state of imbecility. From the first he treated the Queen with coldness. In the course of time she became involved in an amour with Struensee, the court physician, who was appointed Cabinet Minister and created a count (1771), and who was generally supposed to be the father of her daughter born in 1771. Early in 1772, as the result of a court intrigue, the Queen and Struensee were arrested, each confessed guilt, and Struensee was executed. The royal marriage was declared dissolved, but when it was proposed to banish the Queen, the British government interfered. She received a pension of £5000, was allowed to retain the title of Queen, and spent her last years in a castle at Celle, Hanover. Consult Lagrèze, *La reine Caroline-Mathilde* (Paris, 1887), and Wilkins, *A Queen of Tears* (London, 1904).

CAROLINGIANS (Fr. *Carlovingiens*, ML. *Carolingi*, from OHG. *Karling*, descendant of Karl, particularly Charles Martel). The second dynasty of Frankish kings. The origin of the family is traced to St. Arnulf, Bishop of Metz, who died in 641. His son, Ansegisel, married a daughter of Pepin, of Landen in Austrasia. Their son, Pepin of Heristal, the greatest territorial lord in Austrasia, was called to the office of Mayor of the Palace in that kingdom. At the battle of Testry in 687, Pepin compelled the weak Merovingian King, Theuderich III, to invest him with the office of Mayor of the Palace in all the three Frankish states, Neustria, Austrasia, and Burgundy. Pepin allowed the Merovingian kings to remain upon the throne, but they were kings only in name. He died in 714, and left as his successor a grandson who was a mere child; but Charles Martel, a natural son of Pepin, was made Mayor of the Palace by the Austrasians, and in this capacity brought the three states under his power. He died in 741. His two sons, Carloman and Pepin the Short, divided the kingdom, although for a time the nominal Merovingian dynasty still existed. Carloman abdicated after a few years and entered a monastery. Pepin at last formally assumed the royal power and was crowned King of the Franks in 751. From this is dated the beginning of the Carolingian dynasty. Pepin was succeeded by his sons, Carloman and Charles the Great, or Charlemagne, of whom the latter soon reigned alone and prodigiously extended his dominions. In 800 Pope Leo III set upon his head the crown of the Western Roman Empire. He planned to divide his dominions among his sons, of whom, however, only one, Louis the Pious, survived him, who, in the list of the kings of France, appears as Louis I, but who was properly Emperor and King of the Franks. With Charlemagne the high abilities of his family disappeared, and his successors were comparatively weak. Family feuds broke out during the life of Louis the Pious, who had divided his dominions among his sons, and he terminated his troubled reign in 840. By a treaty concluded at Verdun in 843, Lothair I, the eldest son of Louis, obtained the Imperial crown and the Kingdom of Italy, with Lorraine, Franche Comté, Provence, and Lyonnais; Louis, his brother, called Louis the German, obtained the German part of his father's dominions; and

Charles the Bald, the son of a second marriage, obtained Neustria, Aquitania, and the Spanish Mark. The Emperor Lothair I died in 855, and his dominions were again divided—his eldest son, Louis II, becoming Emperor and King of Italy, and his two other sons kings of Lorraine and of Provence, the kingdoms of the two younger brothers later reverting to the Emperor. Charles II, the Fat, son of Louis the German, reigned over the reunited realm of Charles the Great from about 884 to 887, when he was deposed. Arnulf, King of Germany, obtained the Imperial dignity later, and Louis III, the Child, ruled in Germany from 899 to 911, when the Carolingian dynasty there became extinct. The French dynasty, of which Charles the Bald may be deemed the founder, continued a succession of weak monarchs and pretenders to the throne for about a century, till it terminated with the reign of Louis V, on whose death Hugh Capet, the most powerful nobleman in France, secured the crown in 987. The Carolingian kings had for some time possessed little real power. A subsequent marriage connected their family with that of the Capets and enabled the kings of the Capetian dynasty to trace their descent from Charlemagne. See FRANKS; FRANCE; GERMANY; HOLY ROMAN EMPIRE.

CAROLUS DURAN, ká'ról'us' dū'rān'. See DURAN, CHARLES AUGUSTE EMILE.

CARON, PIERRE AUGUSTIN. See BEAUMARCHAIS.

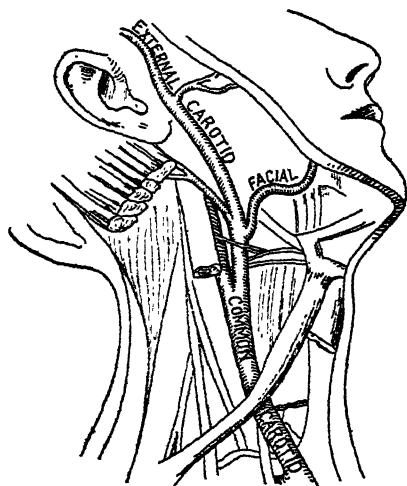
CARON, ká'rōn', RENÉ EDOUARD (1800-76). A Canadian statesman and jurist. He was educated at the Seminary of Quebec and at the College of St. Pierre and was admitted to the bar in 1826. He was mayor of Quebec from 1827 to 1837 and Speaker of the Legislative Council of Lower Canada from 1843 to 1847 and again from 1848 to 1853, when he was appointed judge of the Queen's Bench and abandoned politics. In 1857 he was commissioner for codifying the laws of Lower Canada, and from 1873 until his death was Lieutenant Governor of Quebec.

CARORA, ká-rō'rā. A town in the State of Lara, Venezuela, about 40 miles west by south of Barquisimeto, and midway between that city and Lake Maracaibo. Stock raising and tanneries are the chief industries, and there is a considerable trade in gums and rubber. The town was founded by Spaniards under Capt. Juan del Tejo, in 1569 or in 1572 (accounts vary as to the date). Pop. (1908 estimate), 6000.

CAROTID ARTERY (Fr. *carotide*, Lat. *carotis*, Gk. *kaparís*, *karōtís*, carotid, from *kápos*, *karos*, deep sleep). The great artery which on each side distributes blood to the different parts of the head. Each carotid artery consists of the primitive or common carotid, which, at a level with the upper margin of the larynx, separates into two great divisions of nearly equal size, the external and internal carotid. The external carotid supplies the larynx, tongue, face, and scalp with blood, its principal branches being the superior thyroid, the lingual, facial, occipital, posterior auricular, internal maxillary, and temporal. The internal carotid enters the cavity of the cranium through a somewhat tortuous canal in the temporal bone, and, after perforating the dura mater, divides into the anterior and middle cerebral arteries, which are the principal arteries of the brain; while in its course through the dura mater it gives off the

ophthalmic artery, which subdivides into several small branches that supply the eye and surrounding parts. See CIRCULATION.

Wounds of the carotid trunks are generally from stabs. Suicides have a vague desire to cut them, but rarely cut sufficiently deep by the side of the windpipe. Should either vessel be severed death would result almost immediately. Punctured wounds, however, may not be immediately fatal; they may heal, or a false aneurism (q.v.) may result. These arteries are sometimes the seat of spontaneous or true aneurism. Sir Astley Cooper was the first to tie the common carotid for spontaneous aneurism, in 1805, and since then the operation has been successfully performed many times. Owing to the numerous



CAROTID ARTERY.

interchanges (anastomoses) of branches between vessels of both sides of the head, cutting off the supply of blood through one carotid is seldom followed by impairment of brain structure or function. The common carotid in the horse is the termination of the right arteria innominata. It is a large vessel about an inch long, which emerges from the chest below the windpipe and divides into the right and left carotids. These bend upward, having the windpipe between them, gradually inclining inward at the upper part, where each divides into external and internal carotids, and a large anastomosing branch arising from between these two.

CAROTIN (Lat. *carota*, carrot). An orange-yellow pigment found in the form of amorphous masses in the root of the carrot and, along with xanthophyll, giving that organ its color. It also always accompanies chlorophyll and xanthophyll in the chloroplast, and is the coloring matter of some petals, fruits, and other plant organs. The substances described by the terms erythrophyll, chrysophyll, and etolin are probably carotin. Carotin is a hydrocarbon of the empirical formula $C_{40}H_{56}$, and is closely related to xanthophyll, which has the formula $C_{40}H_{48}O_2$, and is possibly an oxidation product of carotin. Carotin is an isomer of lycopin, the orange-red pigment of certain tomato skins. Carotin and xanthophyll both absorb oxygen readily up to 30-40 per cent of their weight, and are thereby transformed to colorless bodies. This has been taken as evidence that they function as oxygen car-

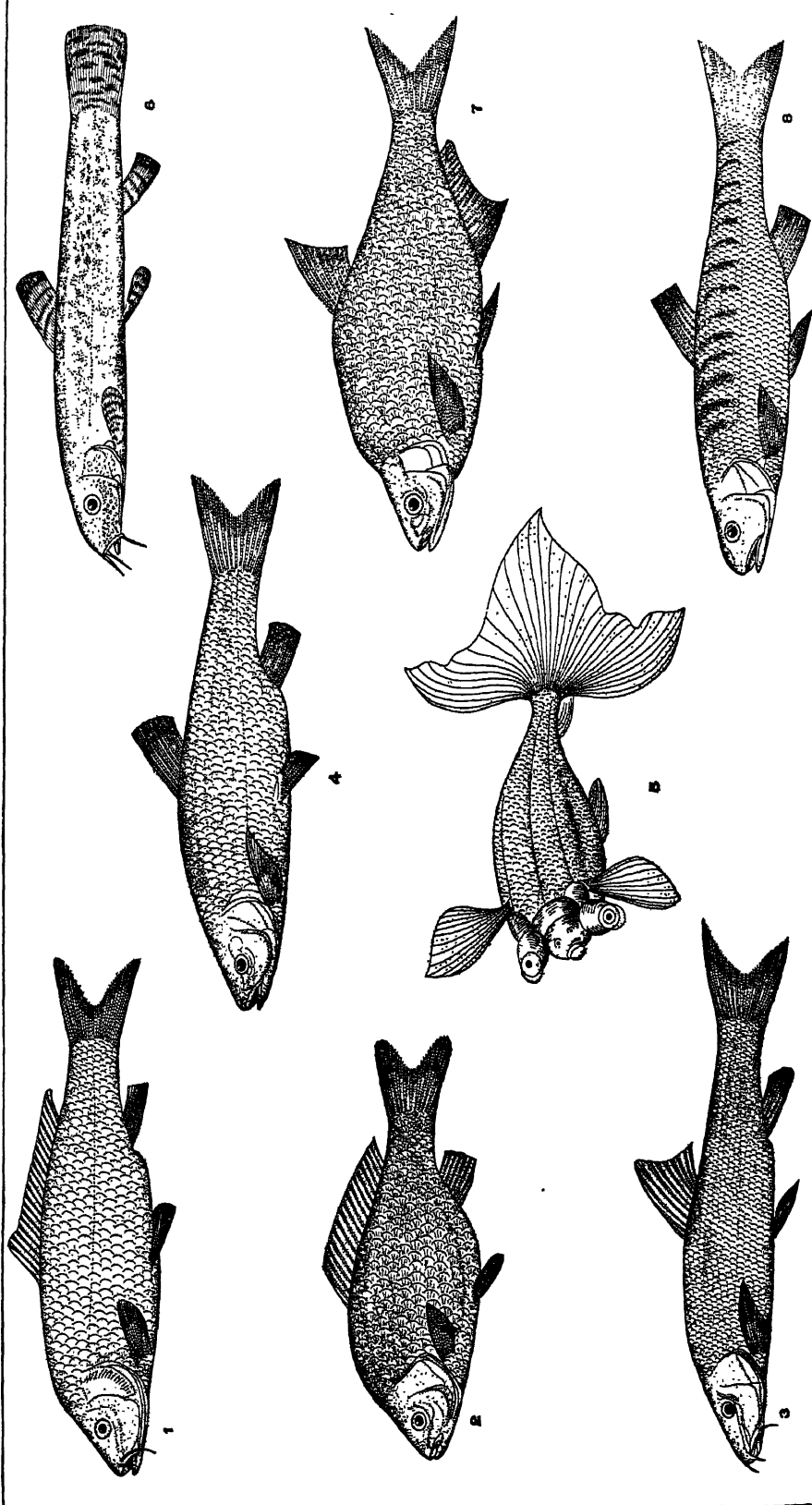
riers in respiration. It has also been claimed that they take part in photosynthesis in a similar way, but to a far less degree than chlorophyll. Though carotin closely resembles xanthophyll, it can be distinguished from it by such physical characters as ease of crystallization, solubility in various solvents, slightly different melting points, and spectra. In the Kraus two-phase (petrol ether-alcohol) system of chlorophyll extract, the carotin is largely held with chlorophyll in the petrol ether, while the xanthophyll is largely held by the alcohol phase.

CAROTO, ká-rò'tò, GIOVANNI FRANCESCO (1480-1555). A Veronese painter of the Renaissance. He was born in Verona, studied there under Liberale, and later in Mantua under Mantegna, who strongly influenced him. Other influences in his paintings are Bonsignori, Leonardo, Raphael, and Giulio Romano; but he never lost a certain individuality and his rich Veronese color, shown particularly in his landscape backgrounds. His works are numerous in Verona, the best being the much-damaged frescoes of the "History of Tobias" in St. Eufemia. Others are: the fresco of "The Annunciation," San Girolamo (1508); the altar of San Fermo Maggiore (1528); various frescoes and panels in San Giorgio in Braida and several panels in the Pinacoteca Comunale. Good examples of his art are in the Castello, Milan, the Chiesa di Carità, Mantua, in the Uffizi and Pitti, Florence, and in the museums of Dresden, Budapest, etc. His works are sometimes confused with those of his brother Giovanni, who was likewise a painter of no mean talent.

CAROUGE, ká'ròozh'. A town of Switzerland, in the Canton of Geneva, a suburb about one mile south of Geneva, on the left bank of the Arve, at an altitude of 1200 feet (Map: Switzerland, A 2). It has many beautiful villas and a handsome church. There are manufactures of thread, clay pipes, leather, watches, and pottery, as well as of machinery and ironwork. A bridge across the Arve connects the town with Geneva. In 1780 the King of Sardinia, as ruler of Savoy, tried to make Carouge the industrial rival of Geneva, but failed. Pop., 1900, 7400; 1910, 7890.

CARP (Ger. *Karpfe*, OHG. *charpho*, Icel. *karfi*, Welsh *carp*, Russ. *karpü*, probably borrowed from the Germanic). A fresh-water fish (*Cyprinus carpio*), typical of the family Cyprinidæ (q.v.), now acclimated in all parts of the world. The body is robust, compressed, and covered with large scales; head naked; mouth rather small, toothless, with fleshy lips and four well-developed barbels. The dorsal fin is quite long, the anal much shorter. The color is a uniform dark brown above, growing quite light on the ventral side. The carp may attain a weight of 40 to 50 pounds, but the usual weight is much less than this. It thrives best in lakes and ponds, and in streams seeks the quiet, sluggish waters, where it feeds largely on vegetable matter, but will also eat insect larvæ, worms, etc. The carp may reach an age of 200 years. It spawns about June; the eggs, which are small, transparent, and number several hundred thousand, are fastened to aquatic weeds, where they will endure great vicissitudes of weather and temperature. During the winter months it hibernates and does not take food. So exceedingly hardy is it, that it may be kept alive even for days in moist moss if properly

CARPS AND THEIR EUROPEAN ALLIES



1. CARP (*Cyprinus carpio*).
 2. CRUCIAN OR GERMAN CARP (*Carassius auratus*).
 3. BARBEL (*Barbus vulgaris*).
 4. CHUB OR SKELLY (*Leuciscus cephalus*).
 5. GROTESQUE VARIETY OF GOLD FISH.
 6. LOACH OR GROUNDLING (*Nemacheilus barbatula*).
 7. COMMON OR YELLOW BREEM (*Abramis brama*).
 8. MINNOW (*Leuciscus phoxinus*).

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fed, and consequently may be transported great distances with facility.

The original home of the carp was southeastern Asia, where it has been tamed and cultivated since the earliest times by the Chinese and where it is still found wild. It was introduced into northern Europe several centuries ago and transplanted about the fourteenth century to Great Britain, under the name of German carp. From Europe it has been brought casually to North America, and about 1870 a strong effort was made to plant it extensively in the still waters of the United States; this succeeded widely, but the extreme prolificacy of the fish, quickly overcrowding small ponds, and the comparative coarseness of its flesh, which is readily tainted by foul waters, have prevented its finding as great favor with the American public as in German Europe. There are three varieties of carp: (1) the scale carp, which, excepting the head, is entirely covered with scales; (2) the mirror carp (*Spiegelkarppe* of the Germans), which has three to four rows of very large scales along the sides, the rest of the body remaining bare; (3) the leather carp (*Lederkarppe*), in which the scales are entirely wanting. All these are equally good as food, although a preference is often shown for the scaled variety. To the angler the carp is not a very valuable fish, as he is by no means a free biter. Several other fishes are called carps, notably the European congener called Crucian (q.v.) and the closely allied goldfish; also some entirely different ones, as the sea-bream and the American carp suckers. Consult Gill, *Smithsonian Miscellaneous Collections*, vol. xlviii (Washington, 1907). See Plate of CARPS AND EUROPEAN ALLIES.

CARP, PETRACHE (1837-). A Rumanian statesman. He was born at Jassy, studied at Bonn, took part in the overthrow of Cuza, and, after Prince Charles had ascended the throne, entered the diplomatic service. With Blaremburg he founded an anti-liberal journal. In 1870-76 he was Minister of Foreign Affairs, in 1892-95 of Commerce, Agriculture, and Domains, and in 1900-01 Premier and Minister of Finance. In 1911 and 1912 he was again head of the ministry. Originally a Conservative, in 1876 he formed a party called the Young Conservatives, or Junimistes. He translated several of Shakespeare's plays into Rumanian.

CARPACCIO, kār-pūt'chō, VITTORE (VETTOR), called Scarpaccia by Vasari (?-c.1525). A Venetian painter of the Renaissance, one of its greatest pageant painters. The researches of Dr. Ludwig in the Venetian archives have disproved the accepted view of his early life. He was not born in Capo d'Istria, where his house is still shown, but in Venice, where his family had lived. In Venice also he spent most of his life and passed his last years. The date of his death is unknown, but he is mentioned as deceased in 1526. It is now established that he studied first with Lazzaro Bastiani, whom Vasari calls his pupil; but he was greatly influenced by Gentile Bellini. He assisted the latter in important pageant pictures, and independently developed the same technical tendencies into a highly original style. His earliest works, "Saints Catharine and Veneranda" (Verona) and a Madonna (Frankfort-on-Main), are reminiscent of Bastiani. In 1490 he began the great series of nine pictures from the life of St. Ursula, for the Scuola di Sant' Ursula, now in the Venetian Academy.

These are not only his masterpiece, but the finest series of pageant pictures painted in Venice during the fifteenth century. Especially charming are the "Dismissal of the Ambassadors," with remarkable light effects; "The Departure of the Betrothed Pair," distinguished by beautiful and ideal types; and "St. Ursula's Dream," a young girl asleep in the quiet morning light. In quality they are unequal, which is in part due to the work of assistants and to repainting. Hardly less attractive is a second series of nine pictures for the Scuola degli Schiavoni (Slavonians). The episodes from the life of St. George, his battle with the dragon, triumph, and the baptism of the King and Queen are particularly attractive. "St. Jerome in his Study" is a charming representation of a Venetian scholar, while "St. Tryphonius Exorcising the Demon" is naïve beyond expression. About the same time he painted (with the aid of his pupils) for the Scuola degli Albanesi (Albanians) six scenes from the life of Mary, now in the galleries of Bergamo, Milan, Venice, and Vienna. His last great cycle, painted (1511-20) for the Scuola di Santo Stefano and depicting scenes from the life of that saint, is now in Berlin, Stuttgart, the Brera, and the Louvre. Besides these great cycles Carpaccio painted many single subjects, such as the "Presentation in the Temple" (1510, Academy); a curious picture, "Two Courtesans on a Balcony" (Museo Civico, Venice); the high altar of San Vitale, Venice (1514); "St. George Killing the Dragon" (1516, San Giorgio Maggiore); the quaint Lion of St. Mark (Ducal Palace); three subjects in the cathedral of Capo d'Istria, and a polyptych in the city of Zara. Carpaccio is one of the most able and attractive painters of the early Renaissance in Venice. His pageant pictures are nothing more than delightful genre paintings filled with admirable portraits and illustrating in an incomparable manner Venetian life of his day. Nevertheless, they are rendered primarily for their pictorial qualities. Though sometimes faulty in drawing, they are clear and harmonious in color and show remarkable treatment of light and atmosphere. The authoritative monograph on Carpaccio is by Ludwig and Molmenti (Milan, 1906); Eng. trans. by Cust (London, 1907).

CARPATHIAN MOUNTAINS. A mountain system of central Europe, extending in the form of a broad arc along nearly the entire boundary of Hungary east of the Danube (Map: Austria, G 2). The arc embraces the plain of Hungary and the elevated basin of Transylvania (Siebenbürgen), separating the former from the Austrian provinces of Moravia, Silesia, Galicia, and Bukovina on the northwest, north, and northeast, and the latter from Rumania on the east and south. Both wings of the arc rest upon the Danube—the one terminating near Pressburg, where it is in juxtaposition to the Leitha Range of the Austrian Alps; the other ending at Orsova, where it confronts the northern extension of the Balkans. The length of the system, following the curve, is about 800 miles. The Carpathian system is composed of numerous mountain groups which exhibit a variety of orographic and geological features. On the northwest the main elevations are included in the Kleine Karpaten (Little Carpathians), the Weisses Gebirge (White Range), and the Neutra and Tatra ranges. These ranges, with bordering ranges of the West Beskiden and the Hun-

garian Erzgebirge, converge in northern Hungary to form a mountain knot, near the centre of which are the Hohe Tatra Mountains, the loftiest in the entire system. Eastward and southward the Carpathians are continued in a broad curve by the Ost Beskiden and by the Waldgebirge into Transylvania, where the ranges widen out so as to surround on the east and west the basin of Transylvania, whose southern limit is the Transylvanian Alps.

The Carpathians include no summits that are comparable in elevation to the culminations of the Alps, but the mountains are frequently massive and imposing in appearance. The highest point of the system is the Gerlsdorferspitze of the Hohe Tatra Range, which is 8737 feet. In the same range are the Lomnitzerspitze, 8642 feet; the Eisthalerspitze, 8630 feet; and the Schlagendorferspitze and other peaks exceeding 8000 feet. In the eastern Carpathians there are many peaks from 5000 to over 7000 feet above the sea. The Transylvanian Alps, whose trend in the main is east and west, present an almost unbroken mountain barrier crowned by jagged summits that reach an extreme height of over 8000 feet, the loftiest peak, Negoi, being 8318 feet. In general, the higher elevations of the Carpathians are composed of granite and crystalline rocks, while the outlying lower ranges are formed by upturned and folded sedimentary strata. Mesozoic sandstone is the prevailing formation in the Beskiden, the granite, gneiss, and schist in the Transylvanian Alps. Eruptive igneous rocks are found along the whole system, but are most prominent in the Hungarian Erzgebirge and in the ranges of Transylvania. These regions are noted for their deposits of gold, silver, lead, copper, and other metallic ores, which have been worked for many centuries. The Carpathian system forms the water parting between the drainage basins of the Oder, Vistula, and Dniester, and of the middle Danube. Small lakes frequently occur in the interior of the mountains, particularly in the Hohe Tatra, where more than 100 have been found. Some of them are at great elevations, and many are very deep. These lakes are called by the Hungarians "Eyes of the Sea." There are no glaciers nor perennial snow fields. Numerous passes cross the system, facilitating communication between Hungary and the bordering countries. The Carpathians are clothed with extensive forests of oak, beech, chestnut, and fir, which harbor bears, wolves, and lynxes. See HUNGARY; TRANSYLVANIA.

CARPATHOS. See SCARFANTO.

CARPEAUX, kâr'pô', JEAN BAPTISTE (1827-75). One of the foremost French sculptors of the nineteenth century, also an able painter. He was born at Valenciennes, the son of a stonemason, and received his earliest instruction from a friendly local architect, Bernard, and from the sculptor Fernand. In 1842 he went to Paris, earning his way as a porter and messenger. He studied with Duret in the Ecole des Beaux-Arts, and with François Rude, whose influence was the strongest in forming his art. After a brilliant record at the Ecole, he received the Roman prize in 1845. In the five ensuing years of study at Rome he developed a strongly characteristic and personal style in painting as well as in sculpture. A typical example of his work of this period is the "Neapolitan Fisher Boy with a Shell" (Louvre). His chief work at Rome was "Ugolino and his Children" (1862), now in the garden of the Tuileries. Exhibited

at Paris, it was greeted with acclaim, except by the academicians. In 1865 he completed the group "Temperance" in the church of La Trinité, Paris, and in the following years the high relief in the pediment of the Pavilion of Flora in the Louvre. His most celebrated work—"The Dance" on the façade of the Paris Opéra (1869)—precipitated one of the bitterest contests in modern art when the nude figure of "The Dance" was indignantly rejected by the Salon as immoral. The group is a masterpiece of realistic presentation and dramatic movement. During the troubles of the Commune he practiced his art in London. He died at Bécon-Château, near Asnières, Oct. 11, 1875. The principal works of his last period are the "Four Quarters of the World Sustaining the Sphere," in the gardens of the Luxembourg; a monument to Watteau at Valenciennes; a painting representing "Napoleon in his Coffin," in the Museum of Valenciennes, and a bust of the Prince Imperial in the Museum of the City of Paris.

Carpeaux ranks with David d'Angers, Rude, and Rodin (qq.v.) as an epoch-making figure in French sculpture of the nineteenth century. His position is analogous to that held in painting by Delacroix, whom he greatly resembles. In his works naturalism for the first time in the nineteenth century achieves a definite and complete victory in sculpture. Academic smoothness of surface is replaced by a modeling based upon a real anatomical knowledge, the varied surface of which affords ample opportunity for contrast of light and shade. Although little known as a painter, he was very original also in this art. Influenced by the old Spanish masters, he foreshadowed in his contrast of light and shade, and the rendition of values, the achievements of Manet and the Impressionists. Three of his paintings are in the Louvre, which also possesses (besides the important works mentioned above) a fine collection of his portrait busts, including those of Alexandre Dumas fils, his wife, Napoleon III, and the Princess Mathilde. In Valenciennes the Musée Carpeaux, founded in his honor, rejoices in many of his sculptures of the early period and a number of paintings. Over 3000 of his spirited drawings are in the Louvre, the Ecole des Beaux-Arts, and the museums of Paris. Carpeaux's biography has been written by important critics, such as Salelles (Paris, 1869), Claretie (ib., 1875), Chesneau, (ib., 1880), and Riotor (ib., 1906). Consult also Blanc, *Les artistes de mon temps* (ib., 1875), and Gonse, *La sculpture française* (ib., 1895).

CARPEL (Fr. *carpelle*, Neo-Lat. *carpellum*, from Gk. *καρπός*, *karpós*, fruit). The name given to the megasporophyll of seed plants (gymnosperms and angiosperms). A sporophyll is the leaflike structure that bears the sporangium, and when there are two kinds of sporangia the two kinds of sporophylls are distinguished as megasporophylls and microsporophylls. In the older terminology the megasporophyll was called the carpel, and the microsporophyll was called the ovule. A carpel, therefore, is the unit structure which bears ovules. There is often confusion in the use of the words "carpel" and "pistil." Pistil is not a word of exactness, for it represents a structure organized into ovary, style, and stigma, whether it consists of one carpel or of several carpels. The so-called "scales" of a pine cone are also carpels which do not inclose the ovules. Ordinarily, however, the word "carpel" is used chiefly of

angiosperms (true flowering plants), and the carpels of gymnosperms are spoken of as scales. See FLOWER.

CARPENTARIA, GULF OF. A broad and deep indentation of the north coast of Australia, with an average length and breadth of 350 miles, stretching from lat. 11° to 17° 30' S. and from long. 136° to 142° E. (Map: Australia, F 4). It was named after Carpenter, a Dutchman, who discovered and partly explored it in 1627. The gulf contains many islands. The shores are generally low with extensive indentations on the west coast.

CARPENTER (OF. *carpentier*, ML. *carpentarius*, from Lat. *carpentum*, cart, from Ir. *carbaid*, *caribh*, chariot, *carb*, basket), NAVY. An officer of warrant rank in the United States and British navies who acts as assistant to the executive officer or first lieutenant (in very large ships) in keeping the hull, spars, boats, etc., of a man-of-war in good condition. In the days of wooden ships he was a skilled mechanic in wooden shipbuilding, but since the advent of iron and steel ships he has been required to have a thorough knowledge of metal working and a practical knowledge of shipbuilding in iron and steel, as well as of woodworking. The carpenter of a ship of the navy is assisted by several artisans, called collectively the *carpenter's gang*, which includes shipwrights, plumbers, blacksmiths, painters, and carpenter's mates. When a carpenter has served six years as such, he is commissioned as a *chief carpenter*, with the rank of ensign. His pay and status are the same as those of the boatswain.

CARPENTER, EDMUND JAMES (1845-1924). An American author, born at Attleboro, Mass. After graduating from Brown University in 1866 he engaged in business until 1878, when he entered journalism. In 1884-96 he was an editorial writer on the *Boston Daily Advertiser*. His works include: *A Woman of Shalmut* (1892); *America in Hawaii* (1898); *The American Advance* (1903); *Long Ago in Greece* (1906); *Roger Williams* (1909); *The Pilgrims and their Monument* (1911).

CARPENTER, EDWARD (1844-). An English author, born at Brighton, England. He was educated at Brighton College and at Trinity Hall, Cambridge, where he became fellow and lecturer. He also served as a curate, but in 1874 gave up his orders in the Church, left Cambridge, and lectured in the University Extension movement until 1881. In 1883 he became a street-corner agitator and lecturer in the Socialist movement. He visited Walt Whitman in the United States in 1884. His publications include: *Towards Democracy* (1883; 5th ed., 1913); *England's Ideal* (1887; 5th ed., 1906); *Civilization: Its Cause and Cure* (1889; 5th ed., 1897); *From Adam's Peak to Elephanta* (1892); *Homogenic Love* (1894); *An Unknown People* (1897); *Angels' Wings* (1898); *Ioläus* (1902); *The Art of Creation* (1904); *The Village and the Landlord* (1907); *Sketches from Life in Town and Country* (1908); *The Intermediate Sex* (2d ed., 1909); *The Promised Land* (1910); *Love's Coming-of-Age* (3d ed., 1911); *The Drama of Love and Death* (1912).

CARPENTER, FORD ASHMAN (1868-). An American meteorologist, born in Chicago. He was an assistant observer in the United States Army Signal Corps in 1888-91, and an observer for the United States Weather Bureau from 1892 to 1906, when he became local fore-

caster at San Diego, Cal. He participated in the Nordhoff exploring expedition to Lower California and Mexico in 1903. His works include: *Wind Velocities and Measurements* (1889); *Studies in the Physiography of Lake Tahoe* (1891); *Sunshine and Cloudiness* (1896); *Climatology of San Diego* (1910); *Aviation and Wind Movement* (1911); *Velo Clouds* (1911); *Photographing "Red Snow" in Natural Colors* (1911); *Over the Yosemite Trails* (1912); *The Climate and Weather of San Diego, California* (1913).

CARPENTER, FRANK GEORGE (1855-1924). An American traveler and journalist, born in Mansfield, Ohio. He graduated from the University of Wooster in 1877, two years later beginning his newspaper work as legislative correspondent of the *Cleveland Leader*. In 1881 he began a series of travels which continued for nearly 30 years and took him to all parts of the world. During these journeys he sent articles to newspapers and magazines. He was made a member of many scientific and learned societies and received the degree of Litt.D. from Wooster University in 1911. His published writings include an important series of geographical readers; *Our Colonies and Other Islands of the Sea* (1904); *Africa* (1905); *Carpenter's Readers of Commerce and Industry; South America—Social, Industrial, and Political* (1900); *How the World is Fed* (1907); *How the World is Clothed* (1909); *How the World is Housed* (1911). He also contributed a great number of articles to American journals and magazines.

CARPENTER, FRED WARNER (1873-). An American diplomat, born at Sauk Center, Minn., and educated in the public schools of Lake County. He studied law at the University of Minnesota, and after being admitted to the bar in 1898 was for several years stenographer in a law firm. In 1901 he became private secretary to William H. Taft, who was at the time Governor of the Philippines, and he continued to serve in this capacity while Mr. Taft was Secretary of War and during part of his administration as President. In 1910 he was appointed Minister to Morocco, and later Minister to Siam. The latter position he held until 1913.

CARPENTER, JOSEPH ESTLIN (1844-1927). An English Unitarian theologian, son of William Benjamin Carpenter. He was educated at University and Manchester New Colleges; was minister of the Oakfield Road Church, Clifton, in 1866-69, and of Mill Hill Chapel, Leeds, 1869-75; lectured in Manchester College, London and Oxford, until 1906; and then became principal of Manchester College, Oxford, one of the foremost independent theological seminaries in England. He translated Ewald's *History of Israel* (1867-74, with Russell Martineau) and Tiele's *Outlines of the History of Religion* (1877), and wrote: *The First Three Gospels: Their Origin and Relations* (1890); *The Composition of the Hexateuch* (1900); *The Bible in the Nineteenth Century* (1903); *The Historical Jesus and the Theological Christ*; and a manual on *Comparative Religion* (1913). With Rhys Davids he edited *Digha Nikāya* (1890; 1902) and the *Sumangala Vilāsini* (1886).

CARPENTER, LANT (1780-1840). An English Unitarian minister. He was born in Kidderminster, studied at the University of Glasgow, taught school from 1803 to 1805, and was employed in the Liverpool Athenæum. He then be-

came pastor of a church in Exeter and in 1817 removed to Bristol. He taught at Exeter and had Harriet and James Martineau among his pupils in Bristol. He was much interested in the religious instruction of children and established several Sunday schools. He did much to broaden the spirit of English Unitarianism. He rejected the rite of baptism as a superstition and substituted a form of infant dedication. Among his works are: *Unitarianism, the Doctrine of the Gospel* (1809); *Systematic Education* (2 vols., 1815); *Examination of the Charges Made against Unitarianism* (1820), a reply to William Magee, Archbishop of Dublin; and *Principles of Education* (1820). Consult his *Memoirs*, ed. by his son, R. L. Carpenter (London, 1842).

CARPENTER, LOUIS GEORGE (1861-). An American irrigation engineer, born in Orion, Mich. He graduated in 1879 at the Michigan Agricultural College, studied at Johns Hopkins University, and was assistant professor of mathematics and engineering at the former institution in 1881-88, when he was appointed professor of engineering and physics at the Colorado Agricultural College. He was special agent of the United States artesian-wells investigation in 1890; founded the American Society of Irrigation Engineers in 1891, and in 1899 was appointed director of the agricultural experiment station at the Colorado Agricultural College. The first systematic instruction in irrigation engineering given in any American college was organized by Professor Carpenter.

CARPENTER, MARY (1807-77). An English philanthropist, the eldest child of the Rev. Dr. Lant Carpenter (q.v.). She took an active part in the movement in behalf of orphaned or neglected children, and besides advocating their cause in her writings, founded several reformatories for girls, one of which, the Red Lodge Reformatory, she superintended. In the prosecution of her philanthropic labors she visited India three times, and in 1871 organized the National Indian Association, whose journal she edited. Among her intimate friends were Harriet Martineau and Frances Power Cobbe, the latter being for some time associated with her at Red Lodge. She published: *Reformatory Schools* (1881); *Juvenile Delinquents* (1853); *Our Convicts* (2 vols., 1864), a book which drew public attention to the treatment of young criminals; and *Six Months in India* (2 vols., 1868). Consult J. E. Carpenter, *Life and Work of Mary Carpenter* (London, 1879).

CARPENTER, MATTHEW HALE (1824-81). An American lawyer and politician, born in Moretown, Vt. He spent two years in the United States Military Academy, studied law with Rufus Choate, and in 1848 settled in Wisconsin. He was remarkably successful as a lawyer, and was especially notable for his defense of W. W. Belknap, Secretary of War, when the latter was impeached by the House of Representatives, and for his argument in favor of Samuel J. Tilden before the Electoral Commission (q.v.). Carpenter was twice elected United States Senator from Wisconsin, serving from 1869 to 1875 and again from 1879 until his death. Consult F. A. Flower, *Life of Matthew Hale Carpenter* (Madison, Wis., 1883).

CARPENTER, ROLLA CLINTON (1852-1919). An American engineer. He was born at Orion, Mich., and graduated from the University of Michigan in 1875. From 1875 to 1890 he was

professor of mathematics and civil engineering in the Michigan Agricultural College, where he also had charge of the mechanical department from its organization until 1888. In 1890 he was appointed professor of experimental engineering at Cornell University, also conducting the laboratory of the department of experimental mechanics and research. He was president of the Michigan Engineering Society in 1889; chairman of the national committee for the education of engineers in 1891; and president of the American Society of Heating and Ventilating Engineers (1898). In addition to numerous scientific papers, he has published the following works: *Instructions for Mechanical Laboratory Practice*; *Text-Book of Experimental Engineering* (1892); *Heating and Ventilating Buildings* (1910).

CARPENTER, WILLIAM BENJAMIN (1813-85). An English physiologist, born at Exeter, a son of Lant Carpenter. Soon after his graduation in Edinburgh, in 1839, he published his *Principles of General and Comparative Physiology*, afterward divided into *The Principles of Comparative Physiology* and *The Principles of General Physiology*. These works, together with *The Principles of Human Physiology* (1846) and *The Principles of Mental Physiology* (1874), form a perfect cyclopædia of the biological science of this period. Carpenter likewise published: *A Manual of Physiology*; *The Microscope: Its Revelations and its Uses* (6th ed., 1881); a prize essay upon *The Use and Abuse of Alcoholic Liquors* (1851). His most important original researches are: *On the Structure of Shells*; *On the Development of Purpura Lapillus*; *On the Structure, Functions, and General History of the Foraminifera*. His published works also include: *Zoölogy and the Instincts of Animals* (1857); *Physiology of Temperance* (1870); *Mesmerism and Spiritualism* (1877); *Nature and Man* (1888). He edited the *British and Foreign Medico-Chirurgical Review* and was one of the editors of the *Natural History Review*. He took a chief part in the government expedition sent out in 1868-70 for deep-sea exploration in the northern Atlantic, and contributed largely to the discussion of the vexed question of ocean circulation. He advocated the doctrine of a vertical circulation, sustained by opposition of temperature only, independent of and distinct from the horizontal currents produced by winds. This doctrine was first advanced by Professor Lenz, of St. Petersburg, in 1845; but Dr. Carpenter was ignorant of this when the deep-sea observations, begun in 1868, led him to an identical theory.

CARPENTER, SIR WILLIAM BOYD (1841-1918). An English clergyman of the Established church, Bishop of Ripon. He was born in Liverpool, was educated at the Royal Institution, Liverpool, and St. Catharine's College, Cambridge, and was appointed Hulsean lecturer at Cambridge in 1878. In 1887 he was appointed Bampton lecturer at Oxford, and in 1895 pastoral lecturer on theology at Cambridge. He held several curacies, was vicar of Christ Church, Lancaster Gate, from 1879 to 1884, canon of Windsor in 1882-84, and after 1884 Bishop of Ripon. In 1904 and 1913 he visited the United States and delivered the Noble lectures at Harvard. He was chaplain in ordinary to Queen Victoria, Edward VII, and George V. His publications include: a *Commentary on Revelation* (1879); *Permanent Elements of Religion*

(Bampton lectures, 1889); *Lectures on Preaching* (1895); *A Popular History of the Church of England* (1900); *Witness to the Influence of Christ* (1905); *Some Pages of my Life* (1911); *Life's Tangled Thread* (1912); *The Apology of Experience* (1913).

CARPENTER, WILLIAM HENRY (1853–). An American philologist, born at Utica, N. Y. He was educated at Cornell and Johns Hopkins, Leipzig and Freiburg universities. In 1883 he was instructor in rhetoric and lecturer on northern European literature at Cornell. In the same year he was called to Columbia and there he rose to be adjunct professor of Germanic languages and literature in 1890, professor in 1895, and Villard professor of Germanic philology in 1902, and later also provost of Columbia University. He was chosen vice president of the Germanistic Society of America. His publications include: *Grundriss der neuisländischen Grammatik* (1881); *Nikolasdrapa Halls Prest, An Icelandic Poem from A.D. 1400* (1881); *Some Conditions of American Education* (1911). Professor Carpenter was also a contributor to the *NEW INTERNATIONAL ENCYCLOPEDIA* and other reference works.

CARPENTER BEE. A solitary bee that excavates its nest in solid wood, in a dead twig, or in the pith hollow of various plants; it represents in the United States various species of *Ceratinidæ* and *Xylocopidæ*. The former are smooth, active, flylike little bees, usually metallic blue or green, of which the *Ceratina dupla*, one-quarter inch long, is a familiar example. It bores tunnels into the stems of pithy plants, and especially of brambles. This tunnel is divided into small compartments by partitions made of agglutinated pith. An egg, together with some pollen, is inclosed in each compartment until the entire burrow is filled save a small space at the entrance just large enough to contain the parent female, where she awaits the hatching of her children. The hatching occurs in each compartment in succession, beginning with the bottom, each bee tearing out the partition of its own cell and awaiting the birth of the bee above it. When all are ready, the female sallies forth with her brood and soon after arranges for a second. The large carpenter bees of the family *Xylocopidæ* are represented all over the northern United States by *Xylocopa virginica*, which is as large and noisy as a bumblebee, but differently colored, and on its hind legs bearing tufts of hair instead of pollen baskets. This bee bores its tunnels, which are nearly half an inch in calibre, in solid wood, such as that of dead timber, dry stumps, fence posts, and unpainted woodwork about houses and outbuildings; it is therefore easy to observe the method in detail. A short perpendicular entrance made across the grain leads into the centre of a burrow following the grain, which may be 18 inches long, requiring a month's labor. The raspings formed in excavation are agglutinated, probably by salivary excretions, into partitions dividing the burrow into cells about two-thirds of an inch long, in which the eggs are placed together with balls of pollen and nectar. Several bees may use the same entrance to the tunnel and several chambers may run parallel, but usually they run in opposite directions from the common door. These bees will often utilize an old burrow to save the great labor of digging, and would do so more regularly, perhaps, did they not often find them already preëempted by other kinds

of insects. See BEE, and see Plate of WILD BEES.

CARPENTORACTE. See CARPENTRAS.

CARPENTRAS, kâr'pân'trás' (ancient *Carpentoracte*, of Celtic origin). A town in the Department of Vaucluse, France, on the left bank of the Auzon, at the foot of Mount Venteux, 16 miles by rail northeast of Avignon (Map: France, S., K 4). It contains a number of Roman remains, including a small triumphal arch. It has also an old cathedral, an episcopal palace (now used as a palais de justice), a museum containing a collection of Phœnician bas-reliefs, old fortifications, notable among which is the Port d'Orange, a theatre, and a library of 50,000 volumes. The chief products are leather, wax, chemicals, and fruit. Carpentras also has a considerable trade for its manufactures of silk, dyed fabrics, and hats. Pop. (commune), 1896, 8391; 1901, 10,443; 1911, 11,390.

CARPENTRY. The putting together the parts of a wooden building, or the wooden parts and members of a composite building. (See BUILDING.) It is distinguished from cabinet-work (q.v.) and joinery (q.v.) in that it deals with the larger and heavier sorts of woodwork, while these deal with the finer sorts of woodwork and the lighter forms of construction. The framework of a building and its covering and flooring, the casings of doors and windows, often the doors and windows themselves, are framed and set by the carpenter. In America he also puts in place much of the finer finish and cabinet-work, even when made by others—trim, wainscot, platforms, molds, etc. The carpenter is a skilled craftsman, as his work requires fine tools, careful measurement, and accurate adjustment. For fastening his work he uses chiefly nails and screws; the old-time wooden trenail or pin in heavy structural work has been generally replaced by spikes and bolts. A large part of the woodwork of modern buildings is now made in mills, especially doors, windows with their boxing, blinds and shutters, and moldings of all profiles; these the carpenter or contractor orders as needed, and they are set in place by the carpenter. Stairs and balustrades are also frequently made, and sometimes set up, by special craftsmen, called stair builders.

The mediæval half-timber (q.v.) construction is rarely employed in modern work, at least in America. Where wood abounds as the cheapest material for housebuilding, the carpenter constructs a framework of vertical timbers (the heavier ones called posts, the lighter ones studs) for the walls, resting upon heavy horizontal sleepers (sills) laid on the foundation walls or "underpinning," and of horizontal beams for the floors (the heavier ones called girders, the lighter ones joists), with inclined beams (rafters) for the roof. This framework is covered with boards (sheathing), over which is nailed the outer covering of overlapping boards (siding, clapboards) or shingles, sometimes with an intervening layer of tarred paper, "roofing felt," or like material. The outside trim of doors, windows, cornices, etc., is generally the last to be set up on the exterior. Underflooring of boards is nailed to the joists; "grounds" and laths to the inner faces of the studs, to receive the plastering, doors and windows are hung, the finished stairs set up, the finished flooring of hard wood or of softer wood in narrow strips is nailed to the underflooring, and after the plastering is finished the inside "standing finish" of trim, wain-

scot, baseboards, mantelpieces, etc., is put in place. Figures 1 and 2 show the commonest type of house framing used in the United States,

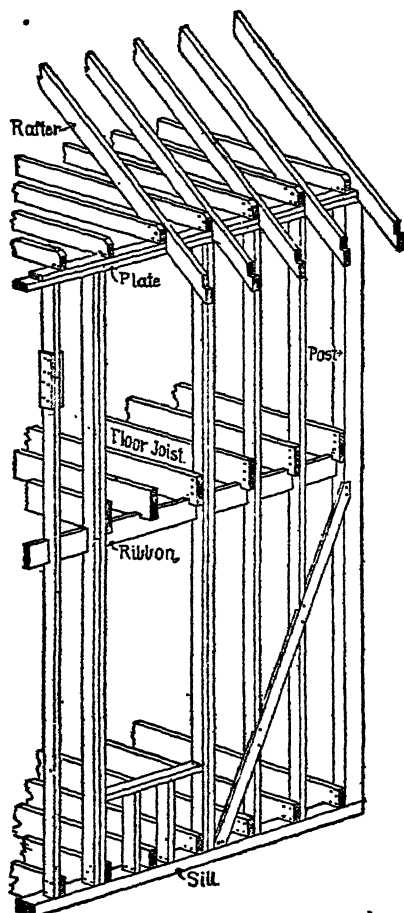


FIG. 1. BALLOON SIDE AND FLOOR FRAMING.

known as the balloon frame, employing for the walls continuous light studs (2×4 or 3×4 inches in section) and posts (6×4 inches) at the corners. A ribbon or girt, "halved" into the studs, receives the wall ends of joists of intermediate stories, and a plate, usually of two 2×4 pieces superposed, receives the rafters and ties or joists of the roof. On such a frame the

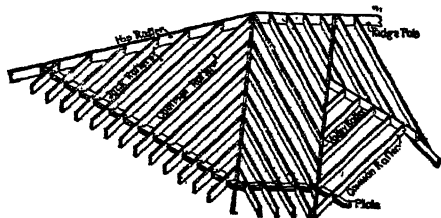


FIG. 2. BALLOON ROOF FRAMING.

sheathing is often nailed diagonally to stiffen and brace it; but in a better class of work strong diagonal bracing is introduced into the frame itself, and the studs and posts are mortised into the sills and girders instead of being

merely "toenailed" to them. In what is called the "full frame" heavy posts are set up at intervals and strongly braced to the sills and plates, and the intervening studs are interrupted at each story by heavy girders from post to post. In Europe heavier timbers are used than is customary in America. Joists in the United States are deep and thin (2×8 , 3×10 , 3×12 inches, etc.), spaced 12 or 16 inches apart and stiffened by cross bridging at every 6 feet; in Europe heavier joists, often square timbers, are sometimes used without bridging.

The various forms of joints for connecting timbers end to end (splicing, halving, scarfing, etc.) and for framing timbers to each other at right angles (mortise and tenon, notching, halving, mitre and tongue, etc.) are too numerous and complex to be described in a short article; a few of them are shown in Figs. 3 and 4; while Figs. 5 and 6 illustrate typical joints

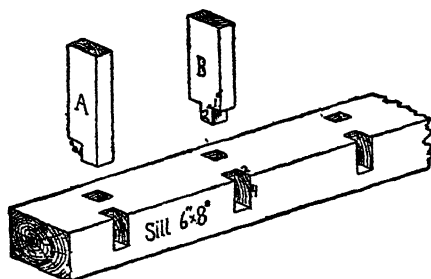


FIG. 3. MORTISED FOR TENONED STUDS AND NOTCHED FOR FLOOR JOINTS.

A, B, Studs.

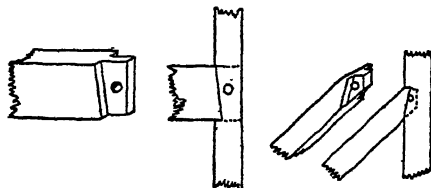


FIG. 4.

MORTISE AND
TENON JOINT
OF GIRT AND POST.

MORTISE AND
TENON JOINT
OF BRACE AND POST.

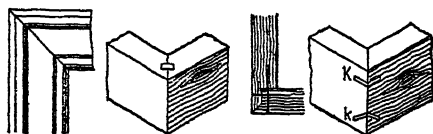


FIG. 5. MITRED JOINTS.

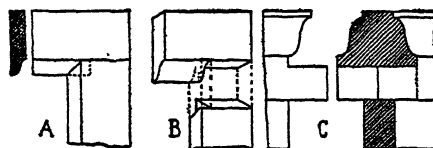


FIG. 6. COPED JOINTS.

employed in the finer kinds of carpentry as well as in cabinetwork.

Ship Carpentry is a distinct form of carpentry, dealing with large timbers, chiefly of oak, hackmatack, teak, and yellow pine, which

must be shaped to the curved lines of the vessel, partly by means of "steaming and bending," partly by hewing with the adze and axe. The planking with which the frame of keel, keelson, ribs, knees, and deck beams is covered is proportionately heavier than in house carpentry, and must be bent, adzed, and planed to the proper curved surface, after the edges have been hewn to the proper shape and bevel to make close joints. The development of iron and steel shipbuilding has resulted in confining ship carpentry chiefly to the construction of the smaller types of vessel, especially yachts, coasting schooners (some of these, however, of great size), and barges, canal boats, and scows. See SHIPBUILDING.

Bibliography. Consult bibliography of BUILDING; also Fletcher and Fletcher, *Carpentry and Joinery for Architects, etc.* (London, 1898); Hatfield, *The American House Carpenter* (New York, 1880); Hodgson, *Modern Carpentry and Joinery* (New York, 1906); Jacoby, *Structural Details, or Elements of Design in Heavy Framing* (New York, 1909); Riley, *Manual of Carpentry and Joinery* (New York, 1906). Also article "Charpente" in Viollet-le-Duc, *Dictionnaire raisonné de l'architecture française* (Paris, 1876).

CARPETBAGGERS. A term of contempt applied by the people of the Southern States to those who came from other parts of the Union to live in the South, or to transact business there, after the close of the Civil War; but applied particularly to those Northern political adventurers who, by the aid of the negro vote, gained control of the State governments in the South; the term also includes those who came to make money by irregular and sometimes criminal means out of the corrupt governments (called carpetbag governments) of the Reconstruction period. (See RECONSTRUCTION.) The term was originally used to designate the "wild-cat" bankers of the West, who defrauded the people and could never be found when wanted; and, by extension of meaning, is sometimes applied to those who drift about from place to place and have no fixed residence.

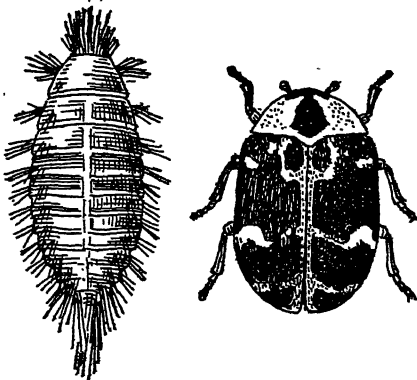
CARPET BEETLE or **BUG**, or **BUFFALO MOTH**. An imported dermestid (*Anthrenus scrofularice*), whose destructive larvæ, first noticed

wing covers; it is thus frequently confused with the much larger and harmless ladybird beetle, that also at times seeks refuge in houses during winter. It feeds on the pollen of flowers. The larvæ are short, fat, hairy grubs, and may be found under the edges of carpets, along seams, in floor cracks, and particularly beneath heavy furniture. They feed on the carpet materials, on the lint that collects under matting and in cracks, and on woolen clothing and furs. Pyrethrum powder sprinkled in places frequented by them is helpful. The carpets of infested houses should not be tacked down, but placed so that they may be examined frequently. Pieces of woolen cloth on closet floors act as traps to attract and collect the larvæ. Infested clothing may be cleared by shutting it up in tight boxes and subjecting it to the fumes of carbon bisulphide. Clothing packed away in tight receptacles with a plentiful supply of naphtha balls is rarely disturbed by the beetles. Two other species of this same genus (*Anthrenus varius* and *Anthrenus museorum*) are great pests of insect, bird, and other museum collections. Consult Howard and Marlatt, *Household Insects* (Department of Agriculture, Washington, 1896). See DERMESTID BEETLES.

CARPET MOTH, SNAKE, ETC. The word "carpet" is often adjectivally applied to animals in the sense of "variegated." Thus a "carpet moth" is one of the geometrids having varied and lively ornamentation; but a carpet-eating moth, as *Tinea tapetzella* (see CLOTHES MOTH), may also be meant. In Australia a scylloid shark (*Crossorhinus barbatus*) is called "carpet shark," and the big, harmless pythonoid snake (*Morelia variegata*), so common in the same country, is everywhere known as "carpet snake." An American instance is found in California, where the beautifully marked little edible clam (*Tapes staminea*) of the Pacific coast is known as the "carpet shell."

CARPETS AND RUGS. In the United States by carpets is usually meant carpeting 27 inches (ingrains 36 inches) wide, cut into lengths, sewed together, and tacked down, completely covering the floor of a room, except the space occupied by hot-air registers; by rugs is meant one-piece or seamless floor coverings, usually rectangular but sometimes round or oval, that leave part of the floor uncovered (at least a foot around the outside), and not being tacked down can be easily removed for cleaning. Imitations of one-piece rugs are also made out of strips of carpeting sewed together, usually so woven that these seamed rugs have an outside border like the seamless ones. In England large rugs are called "carpets," while in the United States they are often spoken of as "of carpet size."

The word "carpet" is derived from ML. *capita*, meaning a "villose or thickish cloth," in other words, a heavy-pile fabric. In Chambers' Cyclopædia (1727-51) "carpet" is defined as "a sort of covering . . . to be spread on a table, trunk, an estrade, or even a passage or floor," "estrade" being an old word for "dais" or "raised platform"; so that we should not be surprised at finding that "on the carpet," like the French "sur le tapis," means not "on the floor," but "on the table"; and at the same time that "knight of the carpet" is so called because dubbed, not in the field, but on the "carpet or cloth usually spread," in the sixteenth century and earlier, before the throne of the sovereign or lord, and that once when servants were summoned before



CARPET BEETLE — LARVA AND ADULT STATES.

in the United States at Buffalo, N. Y., about 1872, have become a widely scattered household pest. The adult beetle is about one-eighth inch long, and covered with scales of black, white, and red, with white spots on the prothorax and

the master for reprimand, they were said "to walk the carpet."

In the Orient carpets, whether for floor, couch, table, or wall, have usually been pile fabrics knotted by hand, although soumaks and kelims (both flat without pile, the former made by twisting warps around pairs of warps, forward over four, back under two; the latter figured reps in real tapestry weave) are also employed. In the Occident, during the Middle Ages and later, the most common floor coverings were coarse tapestries and ingrain.

For a long time the use of imported Oriental pile rugs and of domestic hand-knotted pile rugs was confined to the very rich. Finally, in the middle of the eighteenth century, the invention at Wilton in England of Brussels carpeting, in imitation of floor tapestries, of which Brussels was then the chief centre of production, as it had formerly been of pictured wall tapestries, and the later invention of Wilton carpeting, in imitation of hand-knotted pile rugs, extended the use of carpets widely. Both Brussels and Wilton carpeting are woven usually the width of the old Flemish ell (27 inches, or three-quarters of a yard, which explains why they are called "three-quarter goods"), and the warps are carried by shuttles all the way across the warp, instead of by hand-passed bobbins only part way, as in tapestries. The back of both Brussels and Wilton carpeting consists of warp and weft of cotton or jute, whose function it is to bind fast and serve as an inexpensive body for the extra warps of worsted that, as the weaving progresses, are looped over wires forming the ridges or ribs of Brussels. The cutting of the loops makes Wilton. The figures are formed by six or fewer warps of different colors that are buried in the body when not wanted on the surface. Wilton carpets and rugs (the larger sizes usually seamed), though having a comparatively short pile, from one-quarter to three-eighths of an inch, are the best and most durable of the machine-made goods. They are woven in better qualities and with more wool than Brussels carpets and rugs and cost much less than the superior chenille Axminster. The Wilton patterns are largely Oriental, or at least adapted and simplified from Oriental originals, and average much better than those of Brussels, some of which are still French. However, it is to the spool Axminster that one must turn for Gallo-American designs of the pronounced and obtrusively Baroque and Rococo types. As far as other American carpets and rugs are concerned, the Orientals have things all their own way, with comparatively little competition even from simple modern designs of the type now favored in Germany and Austria. But solid colors are popular in Wiltons, and two and three tone effects in chenille Axminsters and hand-knotted rugs.

Tapestry and velvet carpets and rugs are in their origin merely cheaper imitations of Brussels and Wilton, having only one worsted warp instead of several, and consequently being most economical of the expensive material. Tapestries and velvets are of two types—warp printed and piece printed, or, as they say in the trade, drum printed and machine printed. Warp printing dates from the second quarter of the nineteenth century, while successful piece printing is comparatively recent. The warp prints, as the name implies, have the pattern printed on the warp before weaving, the distortion of the designs due to looping up over the wires having been

calculated against beforehand. The piece prints are woven plain or "in the natural" and printed in the piece after weaving. In order to emphasize the quality of Brussels and distinguish them from tapestries, they are often called "body Brussels," while velvets are sometimes dubbed "Wilton velvets" in order to make them sound better than they are. Tapestry and velvet rugs are usually seamless.

Besides Brussels, Wilton, tapestry, and velvet, the principal types of carpets and rugs found in the shops of to-day are ingrain, Aubusson, savonnerie, spool Axminster, chenille Axminster, Smyrna, rag, fibre, and grass. Rag rugs are seamless, with cotton string warps, and body and surface of coarse twisted-rag warps. Fibre and grass rugs are similar in weave. Ingrains have cotton string warps that are entirely concealed by the two or three sets of heavy worsted weft threads in pairs. When there are two warps, the red one appears on the face where the green one shows on the back. When there are three, one is always buried. Seamless ingrain rugs are called art squares. Solid-color ingrain carpeting is called terry, or filling. The use of figured ingrains that 60 years ago was common throughout the United States is now confined to the rural districts. Patterns once famous that still survive are Henry Clay, Eagle Head, and Martha Washington. Henry Clay shows a huge, conventionalized floral, evidently copied remotely from some ancient Roman floor of marble tiles with metal inlay. Eagle Head not only shows the two-headed bird that crowns the coats of arms of Russia, of Austria, and of the old Holy Roman Empire superseded by Napoleon in 1806, but also two lyres of classic shape and suggestion. Martha Washington is more modest, appealing to a less classic and less learned taste.

Of Brussels and Wilton carpets and rugs, the intricacy of the pattern is limited by the number of colored worsted warps (never more than six). Not so with moquettes and spool Axminsters, commonly called Axminster (without the spool). The ingenious loom on which they are woven makes it possible to insert a loop of any desired color at any point. The texture of these Axminsters is loose, soft, and very agreeable.

Smyrna rugs, on account of their Oriental patterns, luxurious texture, and seamlessness, were exceedingly popular 20 years ago. They are the result of two weavings—the first producing chenille cords, the second inserting these chenille cords as extra weft in a body of cotton or jute warp and weft, with the chenille fuzz or pile showing on both sides and making a double-faced fabric exactly alike on both sides. Smyrnas are woven without seam up to 12 by 18 feet, but of course the patterns are necessarily much simplified from even the coarsest Orientals.

Chenille Axminster rugs are made like Smyrnas, except that the chenille cord is steamed and flattened into a chenille braid with fuzz on one side only, so that they are one-faced like Oriental rugs and Wiltons and velvets. Although the weave is theoretically not limited as to colors, chenille Axminsters are made mostly with plain fields and in two and three tone effects and any size or shape. The pile of some is seven-eighths of an inch thick, with five-eighths as the average and three-eighths the least expensive. Although several American factories make them, they are

largely imported from England, Scotland, Germany, and Austria. The finest materials are used.

As most real-tapestry rugs are now woven in the little town of Aubusson in central France, Aubusson has become the trade name for them. Savonneries are hand-knotted pile rugs made in France in French patterns. They get their name from the factory founded by Pierre Dupont in 1627 in the ancient soap works (*savonnerie*) at Chaillot, transferred in 1827 to the Gobelins, where it is still active. The name is also given to hand-knotted pile French rugs made at Aubusson and elsewhere.

Hand-knotted rugs were made in Europe at least as early as the thirteenth century by the Saracens of southern Spain. That they were probably made in England as early as the sixteenth century is shown by the examples that survive. Lord Verulam has one with the letters E. R. (Elizabeth Regina) intertwined in the royal arms of England and dated 1570. In the Victoria and Albert Museum is one with the inscription "Feare God and Keep His Commandments, made in the yeare 1603." Hand-knotted rugs are now made at Wilton, but called Axminsters from the little Devonshire village where the factory was first established. About 30 years ago the industry was started in the United States, at Milwaukee, by a German weaver who had learned the art at home. A loom was brought from Germany, others were made like it, and finally all were moved from Milwaukee to New York, where they continued in operation for about 20 years, but with practically no profit. A branch factory established in Elizabethport, N. J., by the English proprietors of the English factory at Wilton was active about five years.

However, the history of the manufacture of carpets and rugs in the United States begins in Colonial days, when each village had its weaver to whom the thrifty housewives brought their parti-colored balls of rags sewed together in long strips. As late as 1890 there were in the United States 854 rag-carpet factories, with an annual output valued at \$1,714,480. To-day there are several important factories making carpets and rugs out of new rags and for the trade. The first American factory for the manufacture of yarn carpets was started in Philadelphia in 1791 by W. P. Sprague. A second factory was started in 1804 at Worcester, Mass., by Peter and Ebenezer Stowell. By 1840 about 1500 looms were in operation, the majority making ingrain. In 1841 came an invention that, combined with the Jacquard attachment already in use, transformed the industry. Erastus Bigelow, a young medical student of Boston, harnessed an ingrain loom successfully to steam power and increased the 8 yards a day possible on the hand loom to 10 yards and later to 25 yards. He also patented a power loom for weaving Brussels and Wilton carpeting and another for weaving tapestry carpeting.

In 1899 the United States had 133 carpet factories (not including rag carpets) operating 10,754 looms and producing 72,344,732 yards of carpet valued at \$48,192,351. In 1850 the value of the total output was only \$5,401,234. In 1909 it was \$71,188,152, from 139 establishments, of which 93 were in Pennsylvania, 16 in New York, 11 in Massachusetts, 9 in New Jersey, and 10 in other States. In value of output New York led, with \$25,806,262 as against

\$24,879,232 for Pennsylvania and \$12,811,981 for Massachusetts.

Tapestry and velvet rugs contributed largely to the increase in the seamless-rug production from 12,171,289 square yards in 1899 to 24,042,152 in 1909, more than doubling, and in value increasing 50 per cent, while the production of carpeting declined. In 1909 the number of carpet and rug looms of all classes had increased to 11,943, of which only 207 were hand looms, decreasing from 9.7 per cent of the total in 1899 to 1.7 per cent in 1909. The feature of the decade was the increase in the production of Axminster carpets from 5,026,778 to 12,507,261 square yards (148.8 per cent) and from a value of \$4,762,269 to \$13,680,806 (187.3 per cent), and Axminster rugs from 327,598 to 3,184,097 square yards (872 per cent) and from a value of \$342,262 to \$3,691,900 (978.7 per cent), while ingrain carpeting decreased from 39,920,849 to 17,799,762 square yards (55.4 per cent) and from a value of \$14,368,930 to \$6,749,672 (53 per cent), and ingrain art squares increased from 2,722,323 to 6,131,862 square yards (125.2 per cent) and from a value of \$1,175,951 to \$2,408,960 (104.9 per cent). The production of Wilton carpets and rugs also increased largely to a total of 5,343,616 square yards and a value of \$10,019,330. See RUG.

Consult: *An Account of the New Manufactory . . . of Carpets after the Manner of that at Chaillot . . . now Undertaken at Fulham by Mr. Peter Parisot* (London, 1753); Christopher Fresser, "Carpets," in *British Manufacturing Industries Edited by G. Phillips Bevan* (London, 1876); Darcel et Guiffrey, *La stromaturgie de Pierre Dupont: Documents relatifs à la fabrication des tapis de Turquie en France au XVIII^e siècle* (Paris, 1882); James Christie, *Catalogue of Elegant Brussels, Wilton, Venetian, and Kidderminster Carpets Sold by Auction by Mr. Christie* (London, 1800); "Oriental and Domestic Rugs: Their Origin, Manufacture, and Marketings," Supplement to the *American Carpet and Upholstery Journal* (Philadelphia, February, 1903); Fred. Bradbury, *Carpet Manufacture* (Boston, 1904); the chapters on "Carpets" and "Rugs" in G. L. Hunter's *Home Furnishing* (New York, 1913).

CARPET SWEEPER. A device for sweeping carpets, consisting of a revolving brush inclosed in a wooden or metal dustpan. Its obvious advantage, in addition to great ease of operation, is that it picks up and confines the dust as it is gathered. Where power or electric current is available, the mechanical carpet sweeper has been largely replaced by the vacuum cleaner, where the dust is removed by suction. See BRUSHES AND BROOMS; VACUUM CLEANER.

CARPI, kār'pé. A town in the Province of Modena, Italy, 11 miles by rail northwest of Modena (Map: Italy, E 3). It contains two cathedrals, a castle, a theological seminary, and a theatre. It is the seat of a bishop and was once the capital of the Principality of Carpi. The chief industry is the cultivation of the silkworm. Pop. (commune), 1881, 5987; 1901, 18,788; 1911, 27,465.

CARPI, Ugo di (c.1480-c.1523). An Italian painter and engraver. His teachers in painting and engraving are unknown, and his paintings, none of which have survived, seem to have been of a mediocre character. His chief importance consists in his claim that he was the inventor of chiaroscuro engraving, as he asserted in a

letter to the Venetian Senate in 1516. (See WOOD ENGRAVING.) It is certain, however, that the art was practiced at an earlier date in Germany, for prints designed by both Lucas Cranach and Jobst de Negker antedate his. In any case the process received the name of *chiaroscuro* from him, and he greatly improved it artistically. Only 12 of the 18 plates ascribed to him are authenticated; among the best are "The Massacre of the Innocents" and "Man in Conversation with a Woman" after Raphael, and "Diogenes" after Parmigiano.

CARPINCHO, kār-pēn'chō. See CAPYBARA.

CARPIO, kār-pyō, BERNARDO DEL. See BERNARDO DEL CARPIO.

CARPIO, MANUEL (1791-1860). A Mexican poet, physician, and man of affairs, born at Cosamaloapán, a town in the Province of Vera Cruz. He studied medicine and translated the *Aphorisms* of Hippocrates (Mexico, 1823). He occupied the chair of physiology and hygiene in the Medical College of Mexico. Then he entered politics, represented his country in the Legislature of Vera Cruz, and became senator and Councilor of State, 1853. His *Poesías* and collected poems have gone through several editions; the best is that which appeared in Vera Cruz and Paris in 1883. In his poetic works he shows a cosmopolitan first-hand knowledge of the classics of Latin, Spanish, Italian, and French, which he read in the originals. At his funeral the public of Mexico City gave a spontaneous manifestation of its sense of loss.

CARPOCRATES, or **CARPOCRAS** (Gk. *Καρποκράτης*, *Karpokratēs*, or *Καρποκρας*, *Karpo-kras*). The founder of the Gnostic sect of Carpoctrations. He flourished under Hadrian (c.130 A.D.) at Alexandria. For him the essence of true religion consisted in the union of the soul with the Monas, the Supreme Unity, or highest God, by means of contemplation, which elevated it above the superstitions of the popular faith and liberated it from the necessity of submitting to the common laws of society. Only he is to be reckoned wise who attains this union. Among those who have done so are Jesus, Pythagoras, Plato, and Aristotle. He believed that the worlds were created by angels, who were out of harmony with the Supreme Unity. Carpoctrates also held the doctrine of the transmigration of souls. His followers existed down to the sixth century.

CARPOLITE, or **CARPOLITES** (Fr. *carpolithe*, from Gk. *καρπός*, *karpos*, fruit + *λίθος*, *lithos*, stone). A fossil fruit of which the exact botanical relation is unknown. All these fruits and seeds of uncertain affinities are grouped together in the genus *Carpolites*, which comprises a very heterogeneous assemblage of fossils that vary greatly in respect of form and size. Many species from the Carboniferous rocks, originally described as *Carpolites*, have been more recently recognized as the seeds of gymnosperms, and have been distinguished under new generic names, such as *Cardiocarpum* and *Rhabdocarpum*, which are the seeds of the fossil *Cordaites*. Others from the Carboniferous and Permian rocks, and known as *Trigonocarpum*, may be the seeds of conifers allied to the modern ginkgo. Those *Carpolites* of Tertiary age comprise seeds of all forms, such as achenes, winged fruits, capsules, etc., and they occur in abundance in the Tertiary rocks of some regions of North America and Europe, as at Florissant in Colorado and at Oeningen in Saxony.

CARPOPHYTE (from Gk. *καρπός*, *karpos*, fruit + *φυτόν*, *phyton*, plant, from *φύειν*, *phyein*, to produce). An old term of classification. It includes all those thallophytes, whether algæ or fungi, that produce complex spore cases (sporangia). It would include, therefore, among the algæ, chiefly the stoneworts and the red algæ; and among the fungi, the ascomycetes and basidiomycetes.

CARPOSPORE (Gk. *καρπός*, *karpos*, fruit + *σπορά*, *spora*, seed, from *σπείρειν*, *speirein*, to scatter). The name of one of the spores produced in the life history of the red algæ. Among the red algæ in general, two kinds of spores appear, tetraspores and carpospores. The tetraspores produce plants that bear the sex organs, i.e., are sexual plants. As a result of the act of fertilization, a fruitlike body is produced, called a cystocarp, and it is within this body that the carpospores are produced. When carpospores germinate, they give rise to sexless plants that produce the tetraspores. See RHODOPHYCEÆ and ALGÆ.

CARP SUCKER (on account of the superficial resemblance to a carp). A fresh-water catostomid fish of the genus *Carpiodes*, found in the interior of the United States. It is allied to the suckers and buffalo fishes, of which the common *Carpiodes cyprinus*, called also quillback, spearfish, skimbark, etc., is a prominent example. All are of carplike form and habits, plain olive green above and silvery beneath, and from 1 to 3 feet in length, and have no great value as food or for sport. See Plate of SUCKERS.

CARPUS, CARPAL BONES. See HAND; FOOT; SKELETON.

CARQUINEZ, kār-kē'nēs, **KARQUINES**, or **KARQUENAS**, kār-kē'nās. A strait in California forming a portion of the boundary line between Contra Costa and Solano counties, and connecting Suisun and San Pablo bays (Map: San Francisco). It is 7 miles in length and its width in some parts is nearly 2 miles. It is navigable for large vessels. Benicia is on the north and Martinez, Port Costa, and Crockett are on the south shore. The drainage from the valleys of the Sacramento and the San Joaquin passes through the strait.

CARR, EUGENE ASA (1830-1910). An American soldier, born in Erie Co., N. Y. He graduated at West Point in 1850, entered the mounted rifles, and served against the Indians until 1861, when he received command of the Third Illinois Volunteer Cavalry. During the Civil War he saw much service in the Southwest, led an assault at Port Gibson in the Vicksburg campaign in 1863, and rose in rank until, at the close of the war in 1865, he was brevetted major general. Subsequently he conducted successful operations on the frontier against the Indians, and became colonel in the regular service in 1879, and brigadier general in 1892, a rank which he held at the time of his retirement in 1893.

CARR, JOSEPH BRADFORD (1828-95). An American soldier, born in Albany, N. Y. He was appointed lieutenant colonel of the Second New York Volunteers in April, 1861, at the outbreak of the Civil War, took part in the engagement at Big Bethel, served under McClellan throughout the Peninsular campaign, and on Sept. 7, 1862, was promoted to be brigadier general for gallantry at Malvern Hill. He subsequently participated in the battles of

Fredericksburg and Chancellorsville, commanding a division during a part of the latter; was distinguished for gallantry at Gettysburg; and in 1865 was brevetted major general of volunteers. After the war he became a manufacturer in Troy, N. Y., and took an active part in State politics, being the candidate of the Republican party for several offices, and serving as Secretary of State from 1879 to 1885.

CARR, LUCIEN (1829-1915). An American archaeologist, born in Lincoln Co., Mo. From 1876 to 1894 he was assistant curator of the Peabody Museum of American Archaeology in Cambridge, Mass. With Prof. N. S. Shaler of the Lawrence Scientific School he wrote *Prehistoric Remains of Kentucky*. Among his independent publications are *The Mounds of the Mississippi Valley* (1883) and an historical volume on *Missouri* (1888).

CARR, ROBERT, VISCOUNT ROCHESTER, EARL OF SOMERSET (? -1645). The worthless favorite of James I of England. He was a younger son of Sir Thomas Ker (Carr), of Ferniehurst, Scotland. In 1603 he followed the King to England in the capacity of page; but he was presently discharged, retiring for a short time to France. He soon returned to the court, and in 1604 a mishap in a tilting match brought him to the attention of the King, who was struck by his pleasing appearance. James had a strong predilection for youthful male beauty; and besides he was desirous of freeing himself from the control of the Council, so that he might in effect become his own minister. To accomplish this purpose an old unconstitutional instrument was employed. He substituted a favorite for his constitutional adviser. Carr was loaded with wealth and honors. In 1607 he was knighted. Two years later he received Raleigh's confiscated manor of Sherborne. He became Viscount Rochester in 1611 and Earl of Somerset in 1613. He was the sole medium of the royal favor and authority, although he was devoid of every statesmanlike quality and had only his good looks and high animal spirits to commend him.

In the meantime he became enamored of Lady Frances Howard, wife of the Earl of Essex. Through the influence of the King and her relatives, the Earls of Suffolk and Northampton, heads of the powerful Howard family, Lady Frances succeeded in having her marriage with Essex annulled by a special commission; and soon thereafter, on Dec. 26, 1613, she married the newly created Earl of Somerset. The latter's influence had already begun to wane before that of George Villiers, when, in 1615, the murder of Sir Thomas Overbury, who had died of poison in the Tower in 1613, came to light. Overbury had enjoyed the confidence of Carr, then Viscount Rochester, during the amorous intrigue with Lady Essex, who later, actuated by fear or dislike, determined to put him out of the way. The Earl and Countess of Somerset were tried for the murder, and both were condemned to death. The Countess pleaded guilty; but the complicity of Somerset in the crime has never been clearly established. Both received the royal pardon. Somerset lived in obscurity until his death in 1645. Consult: Ranke, *History of England, Principally in the Seventeenth Century*, vol. i (Oxford, 1875); Gardiner, *History of England*, vol. ii (London and New York, 1889); the latter's article in *Dictionary of National Biography*, vol. ix; and

Archbishop Abbot, *The Case of Impotency . . . in that Remarkable Tryal An. 1613, Betwixt Robert, Earl of Essex, and Lady Frances Howard* (London, 1715); Amos, *The Great Oyer of Poisoning* (London, 1846).

CARR, SIR ROBERT (?-1667). One of the English commissioners to New England, appointed by Charles II in 1664, his associates being Nichols, Maverick, and Cartwright. Nichols and Carr captured New Amsterdam from the Dutch in 1664 and changed its name to New York. Carr then forced the Dutch and Swedes on the Delaware to capitulate and afterward went to Boston, but when he attempted to supersede the constituted authorities he met with stubborn opposition from the people of Massachusetts, who refused to acknowledge the jurisdiction of the commissioners, as did also the people of New Hampshire. Maine, however, submitted and was governed separately from Massachusetts during 1666-68. In 1667 Carr returned to England and died on the day after his arrival.

CARRACCI, kâr-rât'ché, or CARACCI. A celebrated family of Bolognese painters, founders of the Eclectic school.—The chief representatives, **LODOVICO** (1555-1619), **AGOSTINO** (1557-1602), and **ANNIBALE** (1560-1609), worked and taught together; their style is similar, and they may therefore be treated together. Lodovico, the eldest, was born in Bologna on or shortly before April 21, 1555, the son of a butcher. He studied there under Prospero Fontana, the Mannerist, and in Florence under Passignano. In Florence he also became thoroughly acquainted with the works of Andrea del Sarto. He was influenced most of all by Correggio in Parma and by his pupil Parmegianino, and in Venice he studied chiefly Veronese and Tintoretto. With this equipment he returned to Bologna and was admitted into the guild of painters on March 23, 1578. He had in the meanwhile formed the ideal of an art which should unite the excellences of the chief Italian schools, and associated with himself the two sons of his father's cousin, who were to help him carry it out.

Agostino, the elder of the two, was born in Bologna, Aug. 15, 1557, the son of a tailor. He was intended for a goldsmith, but upon Lodovico's advice he studied painting under Fontana and engraving under Domenico Tibaldi. His brother Annibale, baptized Nov. 3, 1560, was to be a tailor, but was taken into Lodovico's house to learn painting. The latter sent both brothers to Parma and Venice to study. Annibale, in particular, was impressed by Correggio and has left admirable copies, now in the Pinacoteca of Parma, of that master's frescoes in the Tribune of San Giovanni. In Venice he studied Titian and Veronese, while Agostino became a friend of Tintoretto and occupied himself chiefly with engraving, as a pupil of Cornelis Cort (q.v.).

Upon their return to Bologna, in 1582, Lodovico, who had attained prominence, associated them with him in the decoration of Palazzo Fava. The subjects represented were "Scenes from the Æneid" and the "Voyage of the Argonauts"; and the frescoes, being first attempts, were of no great artistic merit. But the hostile criticism which they caused, especially by reason of their naturalism, caused the Carracci to found their famous academy. (See **BOLOGNESE SCHOOL OF PAINTING**.) They called it the "Accademia degli Incamminati" (i.e., of those on the right

road) and endeavored to give their pupils a theoretical and practical knowledge of painting instead of the mere manual dexterity of the Mannerists. Their means of instruction included living models, dissection of dead bodies, plaster casts, the antique, drawings and engravings of the great masters, lectures on perspective and color. This was, in fact, the first modern academy of art, and it soon became the most important in Italy. Its chief endeavor was to unite the excellences of all Italian schools of the great period. The idea was originally Lodovico's, but the scholarly Agostino gave the theoretical and antiquarian instruction. At this period the Carracci worked much together, and it is difficult to determine the part of each in the common result. Their styles of painting are very similar; good drawing, a certain generality of type, and color based upon a study of the Venetians, and especially of Correggio. In general, we can go no further than to say of this joint work that the design and composition are due to Agostino, but the execution to the other two. In 1589 they finished their second important work in common: the frieze of Palazzo Magnani, representing the "Story of Romulus." In their third joint commission, the decoration of Palazzo Sampieri, each painted a ceiling of a different room, Lodovico representing the "Battle of a Giant with Zeus"; Agostino, "Hercules and Atlas"; and Annibale, "Hercules Encouraged by Virtue." Thus we have a basis for the comparison of their individual styles. Lodovico's art is more virile and grander in form than that of the others; it contains more pathos, more violent action, reminding one somewhat of Michelangelo or Tintoretto. It has traces of mannerism, from which the others are free. His coloring is derived mostly from Correggio and is inferior to that of his cousins. Agostino's was exact in drawing, harmonious in composition, and delicate in color. His work is the most refined of the three and has greater intellectual content: for while his learning chastened his art, it did not interfere with it. Annibale was a more facile painter and executed a far larger number of pieces. His imagination was more spontaneous, and his art more natural and naïve. His colors are fresh and bright, but not so harmonious as those of Agostino.

These differences may be studied even better in their separate works, in which the Gallery of Bologna is richest. The earliest examples show the influence of the masters who were their models, and Lodovico's are strongly tinged with mannerism. His "Sermon of John the Baptist" (1591), in the Gallery of Bologna, shows strong naturalistic tendencies, while the "Vision of St. Hyacinth," now in the Louvre, is a charming combination of the influences composing eclecticism. In like manner, Annibale's "Assumption of the Virgin" (Dresden) and his "Pietà" (Gallery of Parma) show the influence of Correggio, while his "Assumption," in the Gallery of Bologna, reminds one of Veronese. But his "Santa Conversazione" (q.v.), also in Bologna, is a perfect specimen of eclecticism. Annibale executed a large number of small compositions of this description, charming in sentiment and execution. Among his larger canvases, the "Madonna Appearing to St. Luke and St. Catharine" (1592) and the "Resurrection," both in the Louvre, and his "St. Roche Giving Alms" (Dresden) show his highest development in oil painting. His "Three Marys" in Castle Howard

(Yorkshire) shows a wonderful pathos of grief.

Agostino was more occupied with engraving than with painting. In 1589 he engraved Tintoretto's "Crucifixion" in the Scuola di San Rocco with such success that Tintoretto himself pronounced the engraving better than the original. Agostino was fond of living in Venice, where his poetic and scholarly gifts were much appreciated and where his son was born. Upon his return to Bologna he devoted himself anew to painting. His celebrated "Last Communion of St. Jerome," painted for the church of San Michele in Bosco, now in the Pinacoteca of Bologna, dates from 1592. Though surpassed in some respects by Domenichino's picture of the same subject, which was modeled upon it, this composition is a masterpiece of careful drawing, delicate color, and truthfulness of expression. His "Adulteress before Christ," painted somewhat later, is also excellent in color and in action and has a fine architectural background.

Not the least among the achievements of the Carracci was the revival of the landscape (q.v.). They treated it not only as a background for figure painting, as their predecessors had done, but as an independent subject, in which the figures were accessories, thus becoming the originators of the modern landscape and the true predecessors of Gaspard Dughet and Claude Lorrain (see *GELEE, CLAUDE*). This was done by Agostino, and especially by Annibale, who excelled in this work. His landscapes may be found in the galleries of Paris, St. Petersburg, Madrid, Florence, and especially in the Palazzo Doria-Pamfilj, Rome.

In 1597 the Carracci were invited to undertake the most famous and extensive of their works, the decoration of the gallery of the Farnese Palace in Rome. After arranging the business details, Lodovico returned to Bologna, leaving the execution of the work to his cousins. Agostino, assisted by Monsignore Agucchi, determined the composition. The subject was mythological and represented the "Power of Love" over the strong, the proud, the chaste—over the universe. The frescoes show the influence of the Roman school, especially of Raphael; the disposition of space is modeled upon Michelangelo's ceiling of the Sistine Chapel. They are admirable pieces of decoration, the ornamental portion being particularly good. Agostino executed the two principal pictures of the long walls, the "Triumph of Galatea" and the "Rape of Cephalus," his chief works in fresco painting—both excellent compositions, rich and symmetrical in line, fresh and bright in color. Except a few subjects painted after his designs by his pupils, Annibale did the remaining frescoes, which occupied him until 1604. This is unquestionably his best fresco work; his bright and fanciful naturalism is everywhere present. Among the best of these are the admirable genre pieces "Juno with the Girdle of Graces before Jupiter," "Diana and Endymion," "Venus and Anchises," and the "Triumph of Bacchus." Annibale also decorated the ceiling of an adjoining room with mythological subjects, but this work is not so good as that in the gallery.

Agostino was compelled by the jealousy or ill will of his brother to leave Rome, but he was provided for by the Farnesi in Parma, where Duke Ranuccio protected him. He several times portrayed the Duke, but his chief work there

was the frescoes of the Palazzo del Giardino, four mythological love scenes. He lived to complete only three. The quarrel with his brother and his enforced withdrawal from Rome had destroyed his bright spirits. After an apoplectic stroke he withdrew to a Capuchin monastery, where he died, March 22, 1602. In his many-sided talent he resembles the greatest masters of the Renaissance. In addition to being a painter, he was a poet and scholar of high repute. As an engraver he stands in the very first rank of Italian artists. His work is similar to that of his master, Cornelis Cort, but shows more freedom and versatility. He excels in correctness of design and in beauty of execution, and his figures are very expressive. He executed about 278 plates in all, largely from his own designs and after the great Italian masters.

After finishing the frescoes in the Farnese Palace, Annibale suffered much from ill health. The recent researches of Tietze have shown the extent and importance of his Roman atelier. In it labored Domenichino, Albani, and many others, who carried out the designs for his later frescoes and pictures. One of his most beautiful independent canvases is "Christ and the Woman of Samaria" (Imperial Gallery, Vienna); among his portraits is the fine "Lute Player" (Dresden). He died on a brief journey to Naples, July 15, 1609, and was accorded the honor of burial in the Pantheon, Rome, near the resting place of Raphael.

Meanwhile Lodovico remained head of the academy in Bologna, busily engaged in teaching and in executing a number of his most important works. In 1604 and 1605 he decorated, with his pupils, the large court of the monastery Santa Maria in Bosco, near Bologna, with frescoes from the lives of St. Benedict and St. Cecilia. The seven frescoes which he himself executed are admirable pieces of decoration, and although much defaced, they may be studied from the engravings of Giovannini (Bologna, 1696) or Zanotti (ib., 1776). For the cathedral of Piacenza he painted, in 1608 and 1609, two large canvases representing the "Burial of Mary," which are now in the Galleria Farnese, Parma, and a series of fine frescoes: in the sanctuary, "Choruses of Angels" and a "Limbus," and in the arch over the tribune, "Angels Strewing Flowers," the latter work almost equaling Correggio in charm. Between 1609 and his death he executed other important canvases, among which is the "Conversion of St. Paul," in the Munich Gallery. His last works were in the cathedral of Bologna, and a slight mistake in his fresco of the "Annunciation," which he was not permitted to rectify, so troubled him that it brought on a fever, which resulted in his death on Nov. 13, 1619. He was buried with great splendor, noblemen of the city bearing his body to the tomb, for he was greatly beloved as a modest, just, and unselfish man.

ANTONIO MARZIALE CARRACCI (1583-1618), painter, was a natural son of Agostino, upon whom the family placed great hopes, which were thwarted by his early death. He studied under his father and uncle, and his art resembles theirs. His chief works in fresco were in the church of San Bartolommeo del Isola (Rome), but they have been ruined by time and restoration. His chief canvas is "The Flood," now in the Louvre.

Consult Bolognonini-Amorini, *Le vite di Lo-*

dovico, Agostino, Annibale ed altri dei Caracci (Bologna, 1842), and the works cited for Bolognese SCHOOL OF PAINTING, especially that of Janitscheck. The most important publication on the Carracci is: Tietze, "Annibale Carracci's Gallerie im Palazzo Farnese und seine römische Werkstätte," in *Jahrbuch der kunsthistorischen Sammlungen des aller höchsten Kaiserhauses XXVI* (Vienna, 1906); Schmerber, *Betrachtungen über die italienische Malerei im 17 Jahrhundert* (Strassburg, 1906).

CARRAGEEN, kār-rā-gēn (so called from Carrageen in Ireland), CARRAGEEN MOSS, SEA MOSS, or IRISH MOSS. A seaweed, or rather several species of seaweed, used both medicinally and as an article of food. The use of these seaweeds appears to have been originally confined to the peasantry of the coasts of Ireland. They are, however, found on the rocky seashores of most parts of Europe and of the eastern shores of North America, large quantities being gathered for market on the Massachusetts coast. The species which principally constitutes the carrageen of commerce is *Chondrus crispus*, of which the varieties are remarkably numerous. It is 2 to 12 inches long, branched by repeated forking, cartilaginous, flexible, reddish brown. *Gigartina mamillosa* is also gathered as carrageen, and it is doubtless often mixed with the other species. After being collected, carrageen is washed, bleached by exposure to the sun, dried, and packed for the market. The chief nutrients are carbohydrates, though more or less nitrogenous material is also present, as well as small amounts of other nutrients. When treated for 10 minutes with cold water, in the proportion of half an ounce of carrageen to three pints of water, and then boiled and strained, it yields, with or without spices, a very pleasant drink. With a larger proportion of carrageen, a thickish liquid or mucilage is obtained; and on boiling down this decoction and cooling, a stiff jelly is procured. Milk may be employed instead of water in the preparation of the various decoctions; and with the stronger one, along with sugar and spices, when cooled in a mold, a kind of *blanc mange* is obtained. A kind of gelatin is manufactured from sea moss. Other edible marine algæ are dulse (q.v.), or dylick (*Rhodymenia palmata*); sloke, or laver (*Porphyra lacinata*); tangle (*Laminaria digitata*), and many Japanese species. In Hawaii a number of species of edible seaweeds are used under the name "limus."

CARRANZA, V. See MEXICO, History.

CARRARA, kār-rā-rā. A city of north Italy, in the Province of Massa e Carrara, 3 miles from the little seaport of Avenza, which is 32 miles north of Pisa, in a valley surrounded by the marble hills to which it owes its celebrity (Map: Italy, C 2). From 400 quarries 4500 workmen cut and ship more than \$1,000,000 worth of marble yearly, and 600 quarries in the neighborhood help to swell the total. The finest and whitest Italian marble, of which the most valuable varieties are Polvaccio, Bettogli, and Crestola, is found in the valley of Torano, although in recent years the bluish marble of Bardiglio has come into favor. The Romans, whose tools are frequently discovered, called the stone *Marmor lunense*, from the city of Luni, whose ruins are north of Avenza. The United States is represented by a consular agent. Most of the buildings are of marble, and the churches of Sant' Andrea (thirteenth century)

and of the Madonna della Grazie have magnificent marble statues of Rossi, Garibaldi, and Mazzini. There is a museum containing numerous statues and Roman antiquities, and also an academy of sculpture instituted by Napoleon. Most of the marble is shipped via Avenza, which has a small harbor and near which is a fourteenth-century castle of Castruccio Castracani, with bold round towers and pinnacles. Pop. (commune), 1901, 42,097; 1911, 49,492.

CARRARA, kār-rā'ra, FRANCESCO (1805-88). An Italian writer on criminal law, born in Lucca. He became an instructor in criminal law at the University of Pisa, was a deputy in 1865-70, and a senator from 1876. Blindness forced him to leave public life. He opposed capital punishment. His most important work is *Programma del corso di diritto criminale* (13 vols., 1879-86). His other publications include *Opuscoli di diritto criminale* (7 vols., 1878-80) and *Lincamenti di pratica legislativa penale* (2d ed., 1882).

CARRATRACA (kār-rā-trā'ká) SPRINGS. A health resort of Prescott Co., Ontario, Canada, on the Ottawa River, 40 miles east of Ottawa. It is much frequented for the beneficial alterative effects of its mineral springs.

CARRÉ, kà'rà', MICHEL (1819-72). A French dramatist, born in Paris. In 1842 he published a volume of verse, *Folles rimes et poèmes*, which was followed by several poetic dramas, including *La jeunesse de Luther* (1843) and *Scaramouche et Pascariel* (1847). After 1849 he collaborated with Narrey, Battu, Lucas, and especially with Jules Barbier in the composition of numerous comedies, and librettos for vaudevilles and operas. Their joint productions include *Galatée* (1852); *Le pardon de Ploermel* (1859); *Faust et Marguerite* (1859); *Lalla Raukh* (1862); *Romeo et Juliette* (1867); *Mignon* (1867); *Hamlet* (1868); *Paul et Virginie* (1876).

CARREL, kà'rél', ALEXIS (1873-). A distinguished American biologist, widely known for his brilliant investigations and discoveries in the realm of experimental surgery. He was born June 28, 1873, at Sainte-Foy les Lyons, France, and was educated at the University of Lyons, where he received the degrees of L.B. in 1890, Sc.B. in 1891, and M.D. in 1900. He was interne of the Lyons hospital from 1896 to 1900 and prosecutor to the faculty of medicine from 1900 to 1902. Carrel went to the United States in 1905, where his laboratory work received prompt recognition, and in 1909 he was made fellow of the Rockefeller Institution for Medical Research in New York, where he thereafter continued his researches. In 1912 the Nobel prize for medicine was awarded to him. He published a great number of papers, chiefly brief scientific reports, a partial list of which will give some idea of the scope of his activities: *Anastomosis and Transplantation of Blood Vessels* (Philadelphia, 1905); *Doppelte Nephrectomie und Reimplantation einer Niere* (Berlin, 1909); *Graft of the Vena Cava on the Abdominal Aorta* (Philadelphia, 1901); *Heterotransplantation of Blood Vessels Preserved in Cold Storage* (New York, 1907); *On the Experimental Surgery of the Thoracic Aorta and the Heart* (Philadelphia, 1910); *The Preservation of Tissues and its Application to Surgery* (Chicago, 1912); *Rejuvenation of Culture of Tissues* (Chicago, 1911); *The Surgery of Blood Vessels* (Baltimore, 1907); *La transplantation*

des membres (Paris, 1908); *Visceral Organisms* (Chicago, 1912); *Artificial Stimulation and Inhibition of the Growth of Normal and Sarcomatous Tissues* (in collaboration with Montrose T. Burrows) (Chicago, 1911); *Anastomosis of the Blood Vessels by the Patching Method and Transplantation of the Kidney* (in collaboration with C. Guthrie) (Chicago, 1906); *Complete Amputation of the Thigh with Replantation* (Philadelphia, 1906); *Results of a Replantation of the Thigh* (New York, 1906); *Uniterminal and Biterminal Venous Transplantations* (Chicago, 1906); *Results of the Biterminal Transplantation of Veins* (Philadelphia, 1906); *Extirpation and Replantation of the Thyroid Gland with Reversal of the Circulation* (in collaboration with C. Guthrie) (New York, 1905); *A New Method for the Homoplastic Transplantation of the Ovary* (New York, 1906); *Successful Transplantation of Both Kidneys from a Dog into a Bitch with Removal of Both Normal Kidneys from the Latter* (New York, 1906); *The Transplantation of Veins and Organs* (Philadelphia, 1905).

CARREL, kà'rél', NICOLAS ARMAND (1800-36). A French journalist and Republican leader. He was born in Rouen, was educated in the military school of Saint-Cyr, and served for some years in the army. He then went to Paris, where he became the secretary of Augustin Thierry. In 1830, in connection with Thiers and Mignet, he became editor of the *National*, the most spirited and able of the journals opposed to the government of Charles X. His colleagues having entered the government of Louis Philippe, he was left to conduct the *National* himself, which he did with a spirit and a freedom such as had not been witnessed in France for many years. His attacks on more than one occasion checked the arbitrary power the government attempted to exercise and gained for him the admiration and esteem of the popular party. Government persecutions followed his outspokenness, and heavy fines were laid upon him; but these were paid by public subscription, and each conviction only made his journal more popular. Carrel, however, dreaded a revolution as much as he hated despotism and had no sympathy with many of those who looked up to him as a leader. He was mortally wounded in a duel with Emile de Girardin, who had made a violent attack on his personal character. His principal articles were republished by Littré, under the title *Œuvres politiques et littéraires* (5 vols., 1854-58).

CARREÑO, kār-rā'nyò, TERESA (1853-1917). A Venezuelan pianist, born in Caracas. She studied first under her father, who was an amateur musician, and in 1862 appeared at a concert in New York, where she attracted the attention of Gottschalk, who taught her his own compositions. Later she was a pupil of Mathias in Paris. She played with great success in the chief cities of Europe and the United States. Carreño married and was divorced from Emile Sauret, the violinist, the baritone Tagliapietra, and Eugene d'Albert, the pianist. In 1902 she married the younger brother of her second husband. A woman of many talents, she composed a string quartet, piano pieces of the salon order, and the Venezuelan national hymn; she won admiration as a concert singer, and, while managing an opera company, successfully wielded the baton during the absence of the conductor. The chief traits of her playing are bril-

liancy, dash, and masculine vigor, for which she gained the appellation of "the Valkyr of the piano." The softer qualities are not greatly in evidence, but her intellectual grasp and breadth of interpretation place her among the greatest pianists.

CARREÑO DE MIRANDA, dâ mè-rân'dâ, JUAN (1614-85). A Spanish painter, born at Aviles, in Asturias. He studied in Madrid under Pedro de Las Cuevas and Bartolomé Roman, and became court painter to Philip IV and Charles II. After the death of Velasquez he ranked as the first portrait painter of the Spanish court. Many of his religious pictures, for the most part altarpieces, are still in the churches and galleries of Spain; others are in various European collections. They often show Flemish influence, especially that of Van Dyck, in color. His principal surviving frescoes, commissioned in 1669 by Velasquez, who thought well of his art, and painted with the assistance of Francesco Rizzi, are in the cupola of Sant' Antonio de los Portugueses in Madrid and the octagon of the cathedral at Toledo. His chief importance, however, is in portraiture. Among his many portraits of Charles II are one of the King as a boy, in the Berlin Museum (also in the Prado, Aix-la-Chapelle, etc.), and as a man in the Museum of Vienna. His best portraits of Queen Mariana are in the Munich Pinakothek and the Prado. Other characteristic portraits are those of the court fool, Francisco Bazan, and the Russian Ambassador Potemkin. Carreño's art shows especially the influence of Velasquez. His color is richer and warmer, but not nearly so subtle and powerful as his great master's, nor does he approach him (although his drawing is good) in mastery of form. Consult Beruete y Moret, *The Madrid School of Painting* (London, 1909).

CARRER, kâr'rér, LUIGI (1801-50). A Venetian poet and scholar. Abandoning the law for literature, he supported himself for a time as an assistant in a printing office, but later became successively secretary of the Instituto Veneto, professor of belles-lettres in the Scuola Tecnica, and director of the Museo Carrer. Ill health, aggravated by unfortunate domestic relations, resulted in his death at the age of 49. Carrer's erudition expressed itself in many critical and biographical works which adequately reflect the spirit of Venetian culture of the time, sentimental, idealistic, with a tendency towards romanticism, but tempered with classic sobriety and elegance (cf. the *Anello di sette gemme*, 1838, and *Prose*, 1855). He is still much read in his ballads, of romantic temper in subject but classic in their freedom from mysticism and in their clarity of conception. *Works* (Florence, 1854); biography by Crespan (Venice, 1869) and by Abrate, *L'opera poetica di L. Carrer* (Turin, 1905).

CARRERA, kâr-râ'râ, JOSÉ MIGUEL DE (1785-1821). A Chilean politician and revolutionist, the first President of Chile, born in Santiago de Chile. He served in Europe in the Spanish army, rose to the rank of major, went to Chile upon the outbreak there of the revolutionary movement, and became a member of the junta formed on Sept. 10, 1810. Dissatisfied with the methods of the first Congress, which had convened on July 4, 1811, he established a new government, and with the support of the army, himself usurped the presidency. On Dec. 2, 1811, he dissolved the Congress, and thenceforth ruled as a military dictator. During the next 18 months,

in addition to the military operations that had to be continued, he arranged questions concerning public rents, decreed the establishment of primary schools, imported from North America the first printing press that ever entered the country, and published Chile's first newspaper, *La Aurora*. In 1813 he was forcibly removed from authority by the Junta, which appointed Bernardo O'Higgins to succeed him. This change he bitterly resisted, and although he made pretense of cooperating with O'Higgins at the battle of Rancagua (Oct. 1 and 2, 1814), he really rendered that officer no assistance. He then fled to Buenos Aires and thence to the United States. In 1816 he returned to Buenos Aires, where he organized an outlaw band and sought to arouse a revolution against the government. He was finally captured, and was executed at Mendoza, Sept. 5, 1821. Posterity has recognized the real merits of Carrera, and a bronze monument in commemoration of his great worth was unveiled in the Alameda de las Delicias of Santiago (Chile), Sept. 17, 1864.

CARRERA, RAFAEL (1814-65). A Guatemalan revolutionist and politician. He was of Indian and negro descent and entirely without education. He first came into prominence in 1837, when he succeeded in placing himself at the head of a band of insurgents against Morazan and the Federalists. In 1838 he captured the city of Guatemala and in 1839 again held it by force. In 1847 he was elected President of the Republic and in 1851 was reelected for life. He was supported by the landed proprietors and the Church party and recalled the Jesuits, who had been excluded for nearly a century. He always opposed the federation of the Central American states and was a thoroughgoing absolutist. In 1863 he made war on Salvador, took the capital, and expelled the President.

CARRERA, VALENTINO (1834-95). An Italian dramatist, born in Turin. Until his retirement from office in 1878, he was connected with the Italian customs department. His earliest notable success was the comedy *La quaderina di Nanni* (1870), an interesting depiction of life in Florence. The long list of his works includes further *Galateo nuovissimo* (1875), *Bastoni fra le ruote* (1884), and *La filosofia di Giannina* (1885). A collective edition appeared in Turin in 1887-90 (4 vols.).

CARRÈRE, kâ'râr', JOHN MERVEN (1858-1911). An American architect, born Nov. 7, 1858, in Rio de Janeiro, of American parents. His early education in Switzerland was followed by four years of study of architecture in the Ecole des Beaux-Arts, Paris. Here he first became acquainted with a fellow student, Thomas Hastings (q.v.), with whom he entered into partnership in New York in 1884, after two years spent in the office of McKim, Mead, and White. The firm of Carrère and Hastings rapidly acquired a distinguished reputation for the imaginative and artistic quality of its work, strongly colored by French influence. The first important commission of the young practitioners was the Ponce de Leon Hotel at St. Augustine, Fla.; this was followed by the Alcazar in the same place. Other early works were the Central Congregational Church at Providence, R. I., and the Mail and Express and Edison buildings in New York. The list of their later works is very long; by far the most notable is the Public Library of New York, erected at a cost of over \$8,000,000

from designs which won the prize in a competition in which many of the ablest architects of the country were employed. They designed important buildings for the St. Louis Purchase Exhibition in St. Louis (1904) and the great marble office building for the Senate at Washington. All this work was the joint product of the two members of the firm, so that it is not possible to separate Mr. Carrère's work from his partner's. He died March 1, 1911, as the result of an accident. The body was laid in state in the still unfinished Public Library, and the great throngs that pressed to view it attested the high regard in which he was held.

CARRETTA. See CARRIAGE.

CARREY, ká'rǎ, JACQUES. See PARTHENON.

CARRHÆ. An ancient town in Mesopotamia, near which Crassus, the triumvir, was defeated by the Parthians.

CARRIACOU, ká'rǎ-á-koo'. One of the British West Indies, belonging to the Grenadine group of the Windward Islands (q.v.) (Map: West Indies, G 4). It lies nearly 20 miles north-east of the island of Grenada, and is 7 miles long by about 3 miles wide. Area, nearly 11 square miles. Cotton is the chief product. Pop., 1911, 6886.

CARRIAGE (OF. *cariage*, from *carier*, to carry, from Lat. *currus*, car. from Ir. *carr*, car). A wheeled vehicle of any kind. The word is commonly used in a more restricted sense to apply to vehicles for carrying persons as distinguished from those for carrying freight; in this article, however, the term is used in its broader sense. Probably the first instrument employed for drawing burdens was the *sledge*. In Egypt, where we have the earliest recorded development of the arts, we find sledges pictured upon the monuments. For the conveyance of enormous loads, such as the blocks required for the Egyptian monuments, rollers must also have been used. Possibly it was the combination of the sledge and roller which formed the first rude carriage. The next step in the evolution of the carriage would be the substitution of wheels connected by an axle for the rollers extending all the way across the box or platform. As the rollers were simply hewn tree trunks, so the first wheels were thin slices cut transversely from these trunks and connected by another of much smaller diameter. These primitive wheels revolved with their axles, like the wheels of railway trucks. The next step in advance was to mount the two wheels so that they revolved on their axle, while the latter either remained fixed, or moved from side to side only, in a horizontal plane. Another marked improvement was the substitution of wheels with spokes for the clumsy solid wheels.

The use of vehicles drawn by animals was probably introduced very soon after the domestication of the horse and ox. (See CART.) How rapidly the various improvements in the construction of these vehicles were made is uncertain, but they must have been completed at a very early period in the history of civilization. In the writings of Homer and in the early books of the Bible the terms "naves," "felloes," "tires," and "spokes" are used. Covers are said to have been introduced by the Etruscans. Homer tells us that Hera's car was suspended by cords, so as to decrease the jolting. In the later Roman carriages the seat was sometimes placed on long poles, midway between the wheels, to lessen the jar, on much the same plan as the modern buck-

board. During the Middle Ages vehicles were slung upon leather straps for the same purpose. Steel springs were not introduced until about 1700, and the elliptic spring was invented in 1804.

The simplest and earliest form of wheeled vehicle was the cart, or two-wheeled carriage. To its axle a pole was secured when it was destined to be drawn by two animals, or a pair of shafts when it was to be drawn by one animal. The chariots of ancient times, however elaborately ornamented, were of this simple construction. These chariots were used for war, for state purposes, for races, and for hunting; they were rarely used simply as a means of conveyance. War chariots were often armed with scythes, and on their sides were cases to hold the bow, sheafs of arrows, and other weapons of war. The bodies of chariots were small, usually holding but two persons. They were open for entrance at the back and had no seats. At first the wheels were very low, from 3 to 4 feet in diameter. As the chariot was adopted by different nations, its primitive form was greatly changed. The wheels were enlarged, it was made to hold many persons, and finally four wheels were used. Little remained of the original chariot but its name.

The chariot used by the Britons at the time of the Roman Conquest possessed certain characteristics which commended it to the conquerors. It was on higher wheels than the Roman chariot and was entered at the front instead of the back. The pole, instead of sloping upward to the horses' necks, went horizontally out between their bodies and was so broad that the driver could stand on it, and, if necessary, drive his horses from its outer end. But the most striking peculiarity of this chariot was that it possessed a seat. Cicero wrote to a friend in Britain that there appeared very little worth bringing away from Britain except the chariots, of which he wished his friend to bring him away one as a pattern. This form of chariot, called by the Romans the *essedum*, from having a seat, became very popular in Rome, and a diminutive form of the vehicle, with still larger wheels, was adopted for the conveyance of dispatches over the public roads. This carriage, called the *cisium*, resembled the modern gig.

In the National Museum in Washington is an interesting series of models showing the development of wheeled vehicles from the simplest and most primitive forms. Among these models is a reproduction of an Egyptian chariot, based on a wheel and forked brace, which were found at Dashur by H. Abbot, and are now in the museum of the Historical Society of New York. The wheel has six spokes with slots near the hub, through which to run a rope to secure the spokes more firmly. The felloe is in six pieces with scarfed joints. The tire of wood, also with scarfed joints, is attached to the felloe with a lacing of thongs. Near the reproduction of this ancient vehicle stands a miniature child's coach, or *bashkir*, used in Russia, which is probably the oldest surviving type of vehicle still in use. The wheels are of solid wood, through the centre of which holes are pierced by burning. In these holes is inserted a forked stick, which serves both as tongue or pole and axle. The covered body of the vehicle is made from the bark of trees sewn together. Another example, showing how the development of the arts repeats itself among different peoples, is given in the two full-sized carts on exhibition in the museum. The

first of these is a *caretta* or ox cart which was used by the Pueblo and other tribes of Indians of Arizona and New Mexico, as well as in parts of Spain, from which country it was introduced into America. The wheels, which are 3 feet 7 inches in diameter, are solidly built up of three pieces of thick timber, held together by dowels of wood. At the centre of the wheel the wood is left thicker to form the hub. The wheels revolve on an axle 7 feet 11 inches long, to which a tongue 8 feet 11 inches long is attached. A tall frame is constructed of light bows. No seat is provided. The second example of primitive wagon construction is the Red River cart, which was built and used by the half-breeds of British North America. These carts are constructed entirely of wood, including the axles and tires. Each consists of a light frame, poised on an axle connecting two strong wheels. These wheels are 5 feet 3 inches in diameter, and consist of 12 spokes and 6 felloes. The native driver sat on the bottom plank of the cart, and, as the bed of the vehicle is lower than the shafts, his heels were higher than his hips. Over the top of this cart the native attached a hide and made of it a tent. Underneath it he stretched the same hide and converted his vehicle into a boat by means of which he crossed streams. Huge trains of these carts were used for carrying produce over the northern plains, as they were the chief means of land transportation.

Four-wheeled carriages for the conveyance of heavy loads were used by the civilized nations of antiquity, but they are probably of more recent origin than the two-wheeled vehicles. Herodotus tells us that the Scythians used a four-wheeled vehicle, consisting of a rough platform on which was placed a covering like a beehive composed of basketwork and skins. This cover they removed from the wagon and used for a tent. The Romans had many varieties of four-wheeled vehicles. The earliest forms seem to have been used for agricultural purposes, for carrying loads of general merchandise, and for the conveyance of images and vestal virgins in religious processions. Sir William Gell, in his work on Pompeii, describes a wine cart, which is a four-wheeled wagon with an arch in the centre for the front wheels to turn under. During the later days of the Roman Empire chariots were mounted upon four wheels, and were so luxuriously equipped, even when owned by private citizens, that sumptuary laws were promulgated limiting the extent of their decorations. It must be remembered, however, that among the civilized nations of ancient times, as among modern Oriental nations, litters were used for the conveyance of persons from place to place. These litters were supported by poles, and were borne either by mules (*basternæ*) or by men (*lecticæ*). Their popularity undoubtedly retarded the development of pleasure carriages.

During the Dark Ages carriages fell into disuse. The old Roman roads, which had made their use possible, were ruined either willfully or by neglect, and riding upon the backs of horses and mules was the only alternative for those who did not go on foot. Even goods were conveyed chiefly in huge panniers hung on the sides of strong draft animals. Gradually the use of carriages was revived, at first by royalty and the nobility, and later by the families of wealthy citizens. One of the earliest of these vehicles was the *whirligote*, or cot upon wheels.

King Richard II and his mother rode in a *whirligote* in 1380, when she was ill. The *carretta* was another vehicle often mentioned in mediæval literature. It seems to have been simply a highly ornamented two-wheeled cart, the descendant of the ancient chariot. During the fifteenth century these were very popular on the Continent, and in Germany an edict was issued forbidding their use, "because the useful discipline and skill in riding has been almost lost." About the commencement of the sixteenth century the art of coach making assumed great importance in continental Europe. (See COACH.) It was in the construction of coaches, to enable them to turn in a shorter space, that the custom arose of making the front wheels smaller than the hind wheels. With their introduction, also, began the use of leather springs. Carriages were not introduced into England until long after they had become popular on the Continent. State coaches were first built in England during the reign of Elizabeth, and about the same time long wagons for transporting goods, called *caravans*, began to be used. Their introduction was at first vigorously opposed by the sedan chairmen and by the boatmen on the Thames. The general use of carriages dates from the eighteenth century, but their greatest development did not occur in England until the nineteenth century. In the early part of that century, as a result of the work of Telford and Macadam, the highways of Great Britain were put into a condition which made vehicular traffic easy and pleasant. About this time (in 1804) Obadiah Elliott, a coach maker of Lambeth, patented a device by which vehicles were hung upon elliptical springs, thus doing away with the heavy perch, or longitudinal wood or iron pole, which had always been used to connect the front and hind wheels of four-wheeled carriages. So important was this invention considered that Elliott was awarded a gold medal by the Society of Arts. With this invention modern methods of carriage construction began.

Fashion and utility produce frequent changes and developments in carriages, and to the many forms different names are applied in different countries and at different times. Shooting traps, golf carts, mail phaëtons, and spiders are instances of vehicles which in many cases are used for purposes widely different from those for which they were originally designed. Victoria and cabriolet are the names of open-hooded carriages with two seats, while the *vis-à-vis*, an open carriage often fitted with a canopy, has seats for four people in addition to the coachman and groom. The landau is a large carriage for four passengers, where the top may be folded back, thus transforming it from a closed to an open carriage. Somewhat resembling the brougham, but higher, lighter, and somewhat less pretentious and costly, thus making it particularly available for use in the country and smaller towns, is the rockaway. Of similar construction, but lacking the more solid frame and glass of this vehicle, is the depot wagon, a familiar American type. The wagonette, which may or may not have a roof, consists of a box seat for the coachman or driver in front of two longitudinal and parallel seats. The brake, which is well suited for four-in-hand driving, is a high vehicle with two, three, or four parallel and transverse seats, serving as a substitute for the road coach or drag. (See COACH; COACHING.) The brougham or coupé with little transformation becomes the "four-wheeler," which,

especially before the introduction of the hansom, in America, was known as a cab, while the French *fiacre* and the German and Russian *droschke* may be considered a modified form of the victoria or cabriolet. The chaise, a term for a two-wheeled covered carriage, now obsolete, was at one time extensively used, and in the United States was colloquially called a shay, the word being preserved in the familiar poem by Holmes, entitled "The One-Horse Shay."

Of the vehicles used for the convenience of the general public, the cab, the stagecoach, and the omnibus are the principal types. The hansom cab is a two-wheeled vehicle with the driver's seat behind and above the body of the carriage. It was invented in 1835 by an Englishman named Joseph Hansom. The development of the stagecoach is described under COACH. The omnibus is arranged with the entrance for passengers at the back, an aisle running lengthwise with a row of seats on each side facing each other. The omnibus came into use in England about 1829, and a few years later was extensively used in the larger American cities, where, as in New York, it was known as a stage. The introduction of the steam railway and the street railway has decreased the use of horse-drawn omnibuses more than any other class of vehicles, though for many years they formed an interesting feature of Paris and London street travel. To-day their place has been taken by the motor bus. The name and essential features of the omnibus, however, are preserved in a class of private carriage, which still is to be seen, constructed on a smaller scale and carrying more passengers than the usual three-seated vehicle.

A most notable feature in the construction of carriages at the beginning of the twentieth century was the increased use of rubber tires for both city and country vehicles. The pneumatic tire, first used about 1890, did not meet with universal use, being confined to trotting sulkies, runabouts, or heavy omnibuses. Later solid rubber tires were improved and made adaptable for all kinds of pleasure vehicles and are now found universally. The "good-roads" movement in the United States has caused a quite general adoption of broader tires, especially for wagons to carry heavy loads. The passing of the horse in the great cities and the extensive use of motor vehicles have attracted the attention and efforts of the more expert carriage and coach builders and designers, so that the skill that once was expended on the design and construction of carriages is now directed to the bodies of motor vehicles, under which title the more modern developments will be found discussed.

In the United States the carriage and wagon industry has been important since the times of the Colonies, and the growth, as recorded in successive censuses of manufactures up to 1904, was about proportional to the increase of population. That year, however, marked a turning point, as with the growth of motor vehicles there followed a corresponding decline in the manufacture of carriages and wagons. Where in 1899 there were 6792 establishments engaged in the manufacture of carriages, wagons, sleighs, and sleds, and materials entering into their construction, in 1909, as reported in a Bulletin of Manufactures of the Thirteenth Census of the United States, 1910, published in 1913, there were but 5492, although the capital invested in

the industry in the latter year was reported as \$175,473,728, as compared with \$128,961,660 in 1899. On the other hand, the value of the product had increased from \$138,261,763 to \$159,892,547 in 1909 for establishments primarily engaged in the manufacture of carriages and wagons, with an additional product in the latter year valued at \$4,528,011 made by establishments in other industries. The number of family and pleasure carriages manufactured in 1909 was 828,411, valued at \$47,756,118, as compared with 937,409, valued at \$55,750,276, in 1904, and 904,639, valued at \$51,295,393, in 1899. The production of wagons in 1909 and the values were classified as follows: Total number, 587,685, valued at \$39,932,910; business wagons, 154,631, valued at \$16,440,816; farm wagons, 429,952, valued at \$22,615,875; government, municipal, and similar wagons, 3102, valued at \$876,219; public conveyances, such as cabs, hansoms, hacks, omnibuses, etc., were built to the number of 2243, valued at \$939,267. With the exception of business wagons, the various classes enumerated show a decrease over the returns obtained in the census of manufactures of 1904. (Consult Thirteenth Census of the United States, 1910, Statistics for the Carriage and Wagon Industry, Washington, 1913.) At the same time there was a notable increase in the number of automobiles built by establishments primarily engaged in the carriage and wagon industry, which doubtless will show a still greater increase in the years following the census period.

Bibliography. For further information on ancient and modern carriages consult: Burgess, *Practical Treatise on Coach-Building* (London, 1881); Thrupp, *History of the Art of Coach-Building* (London, 1877); Gilbey, *Early Carriages and Roads* (London, 1903); Straus, *Carriages and Coaches: Their History and Evolution* (London, 1912). See CART; COACH; COACHING; DRIVING; HANSOM; MOTOR VEHICLES; PHAËTON; WAGONETTE.

CARRIAGE, GUN. See ORDNANCE.

CARRICAL, ká'r'é-kál'. See KARIKAL.

CARRICK BOROUGH. A borough in Allegheny Co., Pa., 3 miles from Pittsburgh, essentially residential. There are deposits of bituminous coal in the vicinity. Pop., 1900, 311; 1910, 6117; 1920, 10,504.

CARRICKFERGUS, kár'rik-fér'güs (Ir., Rock of Fergus, named after *Fergus MacErbh*). A seaport town of Ireland, on Belfast Lough, 9½ miles north-northeast of Belfast (Map: Ireland, F 2). It is situated within the County of Antrim, and under the Local Government Act (Ireland) of 1898 it forms an Urban District. Carrickfergus extends nearly a mile along the northwestern shore of the lough. Vessels of 500 tons may enter the harbor. The fishery of the bay, which is famous for oysters of an unusual size, employs a large number of the inhabitants. Salt of superior quality and in great abundance is mined. There are spinning mills, bleaching establishments, and manufactures of linen and cotton fabrics. Its chief feature is the picturesque castle, erected by De Courcy in the twelfth century, on a rock about 30 feet high, projecting boldly into the sea, by which it is surrounded on three sides. The ballium or keep is 90 feet in height. From the summit a splendid view is obtained, extending in a clear atmosphere to the Mourne Mountains and the Scotch coast. The castle contains

a barrack, bombproof magazine, ordnance store-rooms, and cannon of large calibre command the entrance of the lough. A considerable portion of the town wall, completed in 1608, is still standing, as well as one of the four entrance gates. Many Protestants sought refuge at Carrickfergus during the Civil War, and the first presbytery assembled in Ireland met here in 1642. In 1690 King William III landed here with his army. The rock on which the King stepped in landing is at the end of the quay, projecting from it, and still forms the landing place. John Paul Jones, in 1778, captured the *Drake* war sloop in the bay, but left the town unmolested. The parish church (Protestant Episcopal), founded in 1164, on the site of a pagan temple, is a fine old building, dedicated to St. Nicholas. There is a literary and scientific society, with reading room, library, and museum. There are several barrows or tumuli in the vicinity. Pop., 1901, 4208; 1911, 4608. Consult S. MacSkimin, *History and Antiquities of Carrickfergus* (Belfast, 1811).

CARRICK-ON-SUIR, kár'rik-ón-shōōr'. A town in the County of Tipperary, Ireland, 12 miles east of Clonmel, in the midst of fine scenery (Map: Ireland, D 4). There is considerable woolen manufacture, and also linen and flax factories. It exports much agricultural produce. In the vicinity are good slate quarries. Carrick-on-Suir became a place of note soon after the Norman Conquest. There are remains of a castle built in 1309. Pop., 1901, 5406; 1911, 5235.

CARRICK'S FORD. A ford over the Cheat River, in Tucker Co., W. Va. Here, on July 13, 1861, a small Confederate force, retreating from Laurel Hill, was defeated by the vanguard of McClellan's army, under Gen. T. A. Morris. Among the killed was the Confederate leader, Gen. R. B. Garnett.

CARRIER, COMMON. A carrier is a person who carries on the business of transporting goods or passengers, by land or water. A *common* carrier is one who performs that service only for hire and for all persons indifferently. The term is applicable to teamsters, truckmen, expressmen, and the like, as well as to railroad and steamboat companies, and the owners and masters of vessels of all kinds engaged in the business of transportation. It does not, however, ordinarily include proprietors of shops who deliver goods to purchasers, nor hotel keepers who maintain conveyances for the purpose of transporting their guests to and from their hotels. In consequence of the peculiar character of the common carrier's occupation, the opportunities which it affords for dishonest dealing with another's property, and its importance to the community, the common carrier of goods has been subjected by the common law to two stringent obligations. In the first place, his service is compulsory; i.e., he is compelled to carry for all who may apply to him, without discrimination; and, in the second place, he is liable for loss or injury to the goods intrusted to him irrespective of any negligence on his part.

It is commonly, though inaccurately, stated that common carriers are responsible for any loss or damage during transportation from whatever cause "except the act of God or of the public enemy." By the weight of authority, the act of God means only such inevitable accidents as occur without the intervention of any human agency, although the decisions do

not wholly agree in defining the phrase. The term public enemy embraces any *de facto* or *de jure* government engaged in an act of war or public hostility against the government of the common carrier. Pirates are also public enemies, but the term does not include robbers, bandits, rioters, or rebels against established governmental authority. In addition to these exemptions, the common carrier is not responsible for losses occurring by reason of acts done by public authority or the default of the shipper, or such as are due to the nature and character or inherent defects of the goods shipped, as, for example, losses by fermentation, evaporation, the ordinary decay of perishable articles, or the natural wear in the course of transportation, provided the carrier exercises reasonable care to make such dangers or the losses resulting therefrom as small as practicable. Railway companies, steamboat owners, and other carriers who allow express companies to carry packages on their cars, boats, or other vehicles are liable as common carriers to the owners of the goods for loss or damage.

The extraordinary common law liability of a carrier may now generally be qualified by special contract or acceptance, assented to by the shipper. The carrier cannot, however, generally exempt himself from liability for negligence, though the English and some American courts hold to a different rule. The special contract is usually, though not necessarily, contained in the bill of lading, baggage check, or passenger ticket. The carrier's common-law liability has also been modified by statute in some jurisdictions, and on Feb. 4, 1887, the Congress of the United States passed the Interstate Commerce Act (q.v.), which created the Interstate Commerce Commission and also provided for the regulation of commerce between the States carried on by carriers by rail or water.

Carriers who undertake general business are bound to accept all freight that is offered, under liability of legal action if they refuse without just excuse; but any carrier may restrict his business to certain goods, in which case he is not bound to accept other classes of goods for carriage. A carrier may require payment of freight in advance, and is entitled to a lien for his freight and for sums which he advances to other carriers in payment of freight. The responsibility of the carrier, as such, begins upon the delivery of the goods for immediate transportation. But where carriers have a warehouse at which they receive goods that are not to be forwarded until further order or a later time, they are in the meantime responsible only as warehousemen (see **WAREHOUSEMAN**), and where goods are received by persons as wharfingers, or warehousemen, or forwarders, and not as carriers, liability is incurred by them only for ordinary negligence. The responsibility of the carrier terminates in most jurisdictions when, after the arrival of the goods at their destination, a reasonable time has elapsed for the consignee to receive them in business hours. This rule, however, is subject to modification in several jurisdictions. Thus, in Massachusetts the carrier's liability terminates as soon as the goods are stored by him in safety, while in the State of New York his liability does not terminate until a reasonable time after notice of arrival is given to the consignee, or reasonable efforts have been made to give such notice. After that the carrier may store them, and is

responsible only for ordinary care. Generally speaking, the agents of corporations which are common carriers, such as railway and steamboat companies, bind their principals to the full extent of the business intrusted to their control, whether they follow their instructions or not; nor will it excuse the company to show that the agents acted willfully in disregard of instructions. The carrier is bound only to carry and deliver goods with reasonable dispatch, but, if a particular time is agreed upon for the delivery of goods, damages incurred through exceeding that time may be recovered.

Carriers of Passengers are not held responsible as insurers of the safety of their passengers. It is commonly said that they are held to the highest degree of watchfulness and care in the conduct of their business. By this it is not intended that the carrier of passengers should exercise all the care and diligence of which the human mind can conceive, but rather a care and diligence commensurate with the extraordinary duty which he assumes as carrier. An unexplained accident to the conveyance of the carrier, resulting in injury to the passenger, is *prima facie* evidence of negligence on the part of the carrier or his servants and throws upon the carrier the burden of showing that he has exercised the care required by law. Passenger carriers are not responsible for injuries caused by the contributory negligence of the passenger, but this rule does not apply when the passenger's negligent act was induced by any just sense of peril caused by the improper or negligent conduct of the carrier.

Carriers of passengers are absolutely responsible for the baggage of passengers intrusted to them, as carriers of goods; but with respect to luggage which the passenger keeps in his own custody the carrier is liable only if loss or injury occurs through his negligence. Carriers of passengers are bound to receive passengers and to make every reasonable effort to carry them the whole route for which they stipulate, and according to the public notices and general customs of their business, but they are not bound to carry persons disorderly in conduct or those having contagious diseases, or those who are otherwise offensive or dangerous to their fellow passengers. The passenger must comply with all reasonable rules or regulations of the carrier with regard to purchasing, showing, and giving up tickets, and in respect to trains, use of cars, etc. Upon his failing to do this the carrier may refuse to accept him as a passenger or eject him from his conveyance. It is under this rule that the carrier is enabled to exclude merchandise and articles known as "express matter" from its passenger cars.

The carrier is bound to carry the passenger to his destination with reasonable dispatch, and at a reasonable time according to the published schedule, and is liable to pay damages for his failure to do so. The passenger ticket, like the bill of lading, is both a receipt and a contract, and unless limited by its terms it is freely assignable. As in the case of the carrier of goods, the carrier of passengers may regulate or limit his liability as carrier by notice or stipulation printed on the ticket and actually or constructively assented to by the passenger. As in the case of carriers of goods also, it is the general rule that the carrier cannot thus exempt himself from liability for his own negligence or that of his servants.

Carriers of passengers by water are generally subject to strict statutory provisions regulating the number of passengers, the amount of provisions, the navigating of the ship, pilotage, etc.

Consult the authorities referred to under CONTRACT; BAILMENT; TORT; NEGLIGENCE; also Hutchinson, *Treatise on the Law of Carriers* (2d ed., Chicago, 1891); Carver, *Treatise on the Law Relating to the Carriage of Goods by Sea* (4th ed., London, 1903); Fetter, *The Law of Carriers of Passengers* (St. Paul, 1897); Judson, *The Law of Interstate Commerce* (Chicago, 1905).

CARRIER, ká'ryá', JEAN BAPTISTE (1756-94). A member of the French National Convention, born at the village of Yolet, in Upper Auvergne. He was procurator of the precinct of Aurillac when the Revolution began. In 1792 he represented Cantal in the Convention, where he soon became one of the most violent agitators. He took part, with Hébert, in the overthrow of the Girondist party, October, 1793, and immediately after was dispatched to Nantes and the Army of the West to assist in suppressing the uprising of La Vendée. Here he became practically an autocrat, although he at first acted in the name of a local committee which he himself selected. His acts were so fiendish as to awaken the horror of the most cruel of the Revolutionists. *Fusillades* and *noyades* (shooting and drowning parties) were his especial delight. Long lines of prisoners were ranged in front of open pits which they had been compelled to dig for their own graves, and were shot down so that their bodies fell by their own weight into the trenches. The hulks of vessels were filled with prisoners and scuttled. Men and women were tied together, hands and feet, and thrown into the Loire. This was called "republican marriage." It is said that during a single month 16,000 were shot or drowned at his orders. Robespierre finally recalled him, and, after the death of Robespierre, Carrier was called to account and vigorously defended himself before the Convention, contending that all his diabolical acts had been necessary under the circumstances and had been done under orders. He was, however, condemned and guillotined, Dec. 16, 1794.

CARRIER, or HOMING PIGEON. See PIGEON.

CARRIERA, ká-ryá'rá, ROSALBA (1675-1757). An Italian miniature and portrait painter, the most important of the eighteenth century. She was born in Venice, and at first learned lace making from her mother, but later applied herself to the decoration of snuffboxes under Jean Stève in Venice. She studied miniature and pastel with unimportant local masters and soon became celebrated throughout Italy, especially for her pastels. The portraits of her early period include those of Maximilian II of Bavaria, Frederick IV of Denmark, the 12 most beautiful Venetian court ladies, the "Artist and her Sister Naneta" (Uffizi), and August the Strong of Saxony, who acquired a large collection of her pastels. In 1720, already famous, she visited Paris and painted portraits of Watteau, the Regent, young Louis XV, and the nobles and ladies of his court. She was elected a member of the Academy by acclamation and presented as her "picture of reception" a "Museum Crowned with Laurel." While in Paris she kept a diary (published by the Abbé Vianelli in 1793), which gives a most entertaining account of her visit there. She returned to Venice in 1721, visited Modena, Parma, and Vienna, and

was everywhere received with much enthusiasm by rulers and courts. She was esteemed the greatest miniature and pastel painter of her day, and her works were compared with those of Correggio. They are delicate in handling and color, graceful in design and vivacious in expression, but often inaccurate in drawing. Towards the end of her life she became blind through overwork and died insane. Her art is represented in many private collections and nearly all the public galleries of Europe, especially in Dresden (143 specimens) and the Louvre. Of particular excellence are "The Four Seasons" (a pastel, Dresden Gallery), six admirable pastel portraits in the Royal Gallery, Venice, and another of the Princess Pia di Savoia-Valcarel. Consult the biographies of Sensier, with translation of her diary (Paris, 1865), Von Hoerschelmann (Leipzig, 1908), and Malamani (Milan, 1910).

CARRIER-BELLEUSE, ká'ryá' be-lēz' (properly CARRIER DE BELLEUZE), ALBERT ERNEST (1824-87). A French sculptor. He was born at Anizy-le-Château (Aisne) and studied at the Ecole des Beaux-Arts, Paris, under David d'Angers. He was first employed as a modeler for the industrial arts and was occupied for five years in this capacity at the Minton porcelain factory at Stoke-upon-Trent, England. His first important work of sculpture was the marble statue, "Death of General Desaix," in the Salon of 1859, which was followed by a Bacchante (1863), purchased by Napoleon III, and others. In 1867 he won the medal of honor with a group, "The Messiah," now in the church of St. Vincent de Paul, and was elected to the Legion of Honor. He carved many ideal figures, such as the "Sleeping Hebe" (Luxembourg), "Angelica," etc. He is seen at his best in his splendidly lifelike busts of Gauthier, About, Renan, as masterly in technique as they are in temperament and expression. During the last 10 years of his life Carrier-Belleuse was director of the art department of the porcelain factory at Sevres.

CARRIÈRE, ká'ryar', EUGÈNE ANATOLE (1849-1906). A French painter and lithographer. He was born at Gournay (Seine et Marne) and studied at Paris at the Ecole des Beaux-Arts and later under Cabanel. During the Franco-German War he passed some time as a prisoner in Dresden, where the art of Rubens made a lasting impression upon him, as may be seen in the glowing colors of his earlier pictures. About 1890 he adopted the gray, misty color scheme with contrasts of light and shadow, so characteristic of his art, but which no other artist has been able to imitate without affectation. His themes are usually scenes of his own domestic life, and he repeatedly introduces the likeness of his wife. The first of these, "The Young Mother" (1879), is now in the Museum of Avignon; it was followed by "The Sick Child" (Montargis), "The First Communion" (Toulon), and the excellent portrait of the sculptor Devillez. Carrière was one of the leaders in the secessionist movement, which led to the founding of the Société Nationale, in which he exhibited, among other works, "Sleep" (1890), the celebrated portrait of Paul Verlaine (1891, Luxembourg), "Maternity" (1892, ib.), "Christ on the Cross" (1897), and "Madame Menard-Dorian" (1906). He also modeled a monument to Verlaine in the style of Rodin, and wrote gracefully and interestingly on art

subjects. Most of his works are in French private collections. Consult the monographs by Séailles (Paris, 1901), Geoffroy, a folio with 75 reproductions (ib., 1901), Morice (ib., 1906), and Faure (ib., 1908).

CARRIÈRE, MORITZ (1817-95). A German philosopher and writer on aesthetics, born at Griedel in Hessen and educated at Giessen, Göttingen, and Berlin. He was professor at Giessen, and later at Munich, and the author of many works on philosophy, religion, aesthetics, and poetry. He was an art critic of high rank. In philosophy he started as a Hegelian, but later followed more nearly the system of Fichte. With the latter, C. H. Weisse, J. U. Wirth, and others, he founded a theistic philosophy which endeavored to reconcile deism with pantheism. His chief works are: *Aesthetik* (2d ed., 1873); *Die Kunst im Zusammenhang der Kulturentwicklung und die Ideale der Menschheit* (5 vols., 3d ed., 1876-86); and *Die sittliche Weltordnung* (1877). His *Gesammelte Werke*, 14 vols., appeared in Leipzig in 1886-94.

CARRIERS. See ATHAPASCAN, TAKULLI.

CARRINGTON, FITZROY (1869-). A leading American print connoisseur, born at Surbiton, Surrey, England. He was educated at Victoria College, Jersey, and came to the United States in 1886. For 21 years (1892-1913) he was identified with Frederick Keppel & Co. (New York), dealers in etchings and engravings, being a member of the firm after 1899. During this period he made a specialty of selecting, arranging, and writing introductions for artistic editions of such works as Dante's *New Life*; *The Queen's Garland* (Elizabethan verse); Rossetti's *Pictures and Poems*; William Morris's *The Doom of King Acrisius*; *The King's Lyrics* (1899); *The Shepherd's Pipe* (1903); *The Pilgrim's Staff* (1906). In 1911, the year before publishing *Prints and their Makers*, he had undertaken the editorship of the *Print-Collector's Quarterly*, a journal unique in the United States. He continued to be editor after 1913, although then giving up his business interests to become lecturer on the history and principles of engraving, at Harvard University, and curator of prints at the Museum of Fine Arts, Boston.

CARRINGTON, HENRY BEEBEE (1824-1912). An American soldier and military historian, born in Wallingford, Conn. He graduated at Yale in 1845 and afterward studied at the Yale Law School and practiced law in Columbia, Ohio. In 1857, while on the staff of Governor Chase, he helped to organize the State militia; and at the outbreak of the Civil War he was made colonel of the Eighteenth United States Infantry and soon afterward brigadier general of volunteers. After the close of the war he served in the West till 1869 and in 1870 was made professor of military science in Wabash College, Indiana. In 1890 he took a census of the Six Nations and the Cherokees. His principal writings are: *Battles of the American Revolution* (1876), regarded as one of the best military histories of the Revolutionary War; *Russia as a Nation* (1849); *The Washington Obelisk and its Voices* (1887); *Washington, the Soldier; Lafayette and American Independence*.

CARRINGTON, RICHARD CHRISTOPHER (1826-75). An English astronomer, born in London. He was educated at Trinity College, Cambridge, and from 1849 to 1852 held the post of observer at the University of Durham. From 1852 he

conducted valuable private investigations at an observatory erected by himself at Redhill, Surrey. He was secretary of the Royal Astronomical Society in 1857-62 and was elected a fellow of the Royal Society in 1860. His chief contributions to science were included in his *Catalogue of 3735 Circumpolar Stars* (1857) and *Observations of the Spots on the Sun from 1853 to 1861* (1863).

CARRION CROW. Any of various large black or dark-colored birds which feed on carrion; in the United States, and southward, the black vulture (*Catharista urubú*), a close relative of the turkey buzzard. It is considerably larger than a crow, the plumage is blackish, and the head is bare, but most of the neck is feathered. It is found abundantly along the Gulf coast and northward to North Carolina and is especially common in the cities and large towns, where it is protected as an indispensable scavenger, and often, as notably about the market in Charleston, becomes half domesticated. The nest is made on the ground under logs or bushes; the eggs are one to three in number, bluish white, more or less spotted with brown. In England the "carrion crow" is a true crow (*Corvus corone*). It is the most like the American crow of any of the five British species, but is a little larger; seldom appears in flocks, but is more of a solitary bird; and not only eats carrion, but even attacks weak animals, such as young lambs, and often eats the eggs and young of other birds.

CARRION FLOWER. See SMILAX.

CARRION HAWK. The birds so frequently referred to by this name in Darwin's *A Naturalist's Voyage* (London, 2d ed., 1877) are caracaras, especially the carancho (*Polyborus tharus*). See CARACARA.

CARRIZO, ká-ré'thō (Sp., from Amer. Indian). The collective Spanish name for a group of tribes formerly occupying both sides of the lower Rio Grande, in Texas, and Tamaulipas, Mexico. They built homes thatched with reeds (*carrizo*), whence the name. They have been practically exterminated by the raiding tribes of Texas, among whom are still many Carrizo captives. Some years ago Gatschet found in the neighborhood of Camargo a few families still speaking their language, which, with others of the adjacent portion of Texas, constitutes a distinct stock, the Coahuiltecan.

CARBOLL, kár'ol. A city and the county seat of Carroll Co., Ia., about 97 miles northeast of Omaha, Neb., on the Chicago and Northwestern and the Chicago Great Western railroads (Map: Iowa, C 2). It has a Carnegie library, a domestic science school, and St. Anthony's Hospital. The principal manufactured products are tractor engines, barbed mesh and field fencing, wire novelties, dog muzzles, etc.; and there are roller and flour mills, an ice factory, marble, cement, and brick works, and a creamery. Carroll was settled in 1867. The government is vested in a mayor, elected biennially, and a unicameral council. The water works are the property of the municipality. Pop., 1900, 2882; 1910, 3546.

CARBOLL, CHARLES, of Carrollton (1737-1832). An American patriot. He was born in Annapolis, Md., and was educated in the Jesuit colleges of Saint-Omer, Rheims, and Louis le Grand. He then studied law in Bourges, Paris, and London, and returned to America in 1765. He inherited the largest of the old manorial

estates of Maryland. In 1775 he was chosen a member of the "Committee of Observation" at Annapolis and in the same year was sent to the provincial convention. In 1776 he was one of the commissioners sent to persuade the Canadians to join in the war against England. Returning to Maryland, he became prominent as an advocate of union and independence, and in July, 1776, was sent to Congress, where on August 2 he signed the Declaration, writing "of Carrollton" after his name, so that there could be no doubt concerning his identity, "Carrollton" being the name of the family mansion. In Congress he was a member of the Board of War. In 1776 he was one of the committee that drafted the Maryland Constitution and was chosen to the State Senate. In 1777 he was again sent to Congress and in subsequent years was repeatedly elected to the State Legislature. In 1789 he was United States Senator and in 1799 was a member of the Maryland and Virginia boundary commission. He died in Baltimore on Nov. 14, 1832, aged 95, the last survivor of the 56 signers of the Declaration of Independence. Consult his *Life*, by J. H. B. Latrobe (Philadelphia, 1824). Consult also Mayer (ed.), *Journal of Charles Carroll of Carrollton during his Visit to Canada in 1776*, as *One of the Commissioners from Congress* (Baltimore, 1845), and Rowland, *Life of Charles Carroll of Carrollton* (2 vols., New York, 1898).

CARBOLL, HENRY KING (1848-). An American clergyman, born in Dennisville, N. J. He was religious and political editor of the *Independent* (1876-98), and in 1890 had charge of the religious census of the United States. In 1898-99 he served as a special United States commissioner to Porto Rico, and later was made assistant secretary in the Methodist Episcopal Church Missionary Society. He was executive secretary of the western section of the Ecumenical Methodist Conference of 1911. Besides government reports and numerous reviews, he has published *The Religious Forces of the United States* (2d ed., 1896) and *Missionary Growth of the Methodist Episcopal Church* (1907).

CARBOLL, JAMES (1854-1908). An American physician and army surgeon, born in England. He was educated at Albion House Academy, Woolwich, England, at the University of Maryland, and at Johns Hopkins Hospital. From 1897 to 1902 he was associated with Major Walter Reed in the study of Sanarelli's supposed yellow fever bacilli, submitting himself to the bite of an infected mosquito, and suffering a severe attack of the disease as a result. He was appointed first lieutenant and assistant surgeon in the United States army, became professor of bacteriology and clinical microscopy at the Army Medical School, professor of bacteriology at the Washington Post-Graduate School, and professor of bacteriology and pathology at George Washington University. He also served as curator of the Army Medical Museum and was finally promoted to brigadier general and surgeon-general in the United States army. He is author of *Yellow Fever* (1905).

CARBOLL, JOHN (1735-1817). An American prelate, the first Roman Catholic Bishop in the United States. He was born in Maryland and was the cousin of the celebrated Charles Carroll of Carrollton (q.v.). He was educated in the Jesuit College of Saint-Omer's, Belgium, and was professor at Saint-Omer's College and

Liège from 1759 to 1771. He then became a Jesuit novice and was prefect of the Jesuit College of Bruges. When the Order of Jesus was suppressed on the Continent in 1774, he returned to America. In 1776 he was chosen by Congress, with Charles Carroll, Benjamin Franklin, and Samuel Chase, to urge the people of Canada to join the Colonies in the war against England. In 1784, on the recommendation of Franklin, Dr. Carroll was appointed by the Pope Prefect Apostolic of the Catholic Clergy in the United States. In 1789 he was appointed Bishop, and in 1808 his see was made the Archdiocese of Baltimore. He founded Georgetown College in 1791. Consult Shea, *Life and Times of the Most Rev. John Carroll* (New York, 1888), being vol. ii of his *History of the Catholic Church in the United States* (1888).

CARROLL, JOHN JOSEPH (1856–). An American priest and scholar, born in Ennis-crone, county Sligo, Ireland. He was taken to the United States as an infant and was educated at St. Michael's College (Toronto) and St. Joseph's Provincial Theological Seminary. He became rector of St. Thomas's Church, Chicago. His writings include: *Notes and Observations on the Aryan Race and Tongue* (1894); *Pre-Christian Occupation of Ireland by the Gaelic Aryans* (2 vols.); *Tale of the Wanderings of the Red Lance*, in Gaelic and English. He also translated *The Rubaiyat of Omar Khayyam* into Gaelic verse in 1909.

CARROLL, LEWIS. See DODGSON, C. L.

CARROLLTON. A city and the county seat of Carroll Co., Ga., 52 miles west by south of Atlanta, on the Little Tallapoosa River, and on the Central of Georgia Railroad (Map: Georgia, A 2). It is in an agricultural and stock-raising region, producing chiefly cotton, corn, and fruits, and has a large cotton trade. The industrial establishments include cotton, cottonseed oil, flour, rolling, and planing mills, foundry and machine shops, agricultural machinery, fertilizer and broom factories, brick-yards, and marble works. The water works are owned by the municipality. Pop., 1900, 1998; 1910, 3297.

CARROLLTON. A city and the county seat of Greene Co., Ill., 54 miles southwest of Springfield, on the Chicago and Alton Railroad (Map: Illinois, B 4). It contains a fine courthouse and a public library. The city is the commercial centre of a fertile region and has flouring mills. Carrollton was settled in 1819 and was surveyed two years later. The water works are operated by the city. Pop., 1900, 2355; 1910, 2323.

CARROLLTON. A city and the county seat of Carroll Co., Mo., 66 miles east by north of Kansas City, on the Atchison, Topeka, and Santa Fe, the Wabash, and the Chicago, Burlington, and Kansas City railroads (Map: Missouri, C 2). It is in a fertile agricultural region, of which it is the commercial centre, and has flour mills, a creamery, wagon and harness factories, foundry and machine shops, acetylene generator, furniture and farm-machinery factories, and a large poultry-feeding station. Carrollton was settled in 1819 and incorporated 12 years later. There is a monument there, erected by the Federal government, over the grave of Gen. James Shields, hero of the Mexican and Civil wars, and United States Senator from three States. Pop., 1900, 3854; 1910, 3453.

CARROLLTON. A village and the county seat of Carroll Co., Ohio, 27 miles southeast of

Canton, on the Wheeling and Lake Erie Railroad (Map: Ohio, H 4). Deposits of coal, natural gas, and clay are found in the surrounding region, which is largely agricultural. The principal industries are the manufacture of pottery, rubber, toys and novelties, and granite paving brick. The water works are owned by the village. Pop., 1900, 1271; 1910, 1730.

CARRON. A village in Stirlingshire, Scotland, on the right bank of the Carron Water, about 1 mile from Falkirk. It is celebrated for its ironworks, which were established in 1760 and are among the largest of the kind in Britain. The town gives its name to the obsolete *carronade*, a short cannon formerly used in naval service. Pop., 1500.

CARRONADE (from the Scotch village *Carron*). A short, light gun of relatively large bore, which was carried by men-of-war about the beginning of the nineteenth century. The size of the shot used made them useful in close engagements, but they had slight range and little penetrative power. See ORDNANCE; GUNS, NAVAL.

CARRON OIL. A mixture of equal parts of lime water and linseed oil, employed as a dressing for burns. Its name is derived from that of the ironworks in Scotland at which its reputation was made. Carron oil is a soapy, thick, and inelegant mixture. It is often used in household emergencies, but has been largely superseded by cleanly antiseptic ointments. See BURNS AND SCALDS.

CARROT (Fr. *carot*[t]e, Lat. *carota*, probably from Gk. *καρῶν*, *karōn*, carrot), *Daucus*. A genus of plants of the natural order Umbelliferae. They are mostly natives of Europe. The common carrot (*Daucus carota*) is a biennial plant. The wild form is a bad weed. It has a slender, woody root of a very strong flavor. The improvement of the species is thought to have begun in Holland. It was introduced into England at the beginning of the sixteenth century and is now in general, though not extensive, cultivation as a stock food and for culinary purposes. The roots have a yellow, white, or reddish color. The culinary sorts are generally small, mature early, and vary as much in form as do radishes. The stock carrots have a long, tapering root and generally mature late, making their best growth during the cool weather of fall. For illustration, see Plate of TANSY. See also Plate of ONIONS.

Carrots for the table may be sown as soon as the weather is settled in the spring, in rows 1 to 2 feet apart, and the plants thinned to 2 to 3 inches in the row. A rich, sandy loam soil is best. The early crop requires about the same cultivation as do radishes. At maturity the roots are bunched and marketed like radishes. Carrots for stock are planted in the field in April or May, in rows 18 inches to 2 feet apart, and the plants thinned to 3 to 4 inches. See DICOTYLEDONS.

Feeding and Food Value.—Carrots contain, on an average, in addition to 88.6 per cent of water, 1.1 per cent of protein, 7.6 per cent of nitrogen-free extract, 1.3 per cent carbohydrate, and a little fat and ash. They are relished by horses and serve well for other stock, especially dairy cows. They are a very succulent feed. Carrots are often grown as a vegetable and are served boiled and seasoned in a variety of ways. As ordinarily prepared for the table, the refuse (skin, etc.) constitutes about 20 per cent of the

whole root. When carrots are boiled in water, there is usually a loss of nutritive material, consisting of sugar and other substances extracted by the water. If the whole carrots are cooked quickly, or cut in large pieces, the loss is less than is otherwise the case. Carrots contain a coloring matter which is used to some extent as a butter color. Consult: Percival, *Agricultural Botany* (1900): N. Y. Cornell Experiment Station Bulletins 243 (1906), 244 (1907), 317 (1912).

CARROUSEL, kà'rù'sèl' (Fr., a tilting match, from It. *carosello*, tournament, for *garosello*, from *garoso*, quarrelsome, *gara*, strife, from *guerra*, war, OHG. *uera*; connected by popular etymology with It. *carricello*, little car, dim. of *carro*, car). Originally, a species of knightly exercise which, even down to the beginning of the eighteenth century, was very common at all the courts of Europe. A carrousel was a kind of imitation of the tournament and for a time after the discontinuance of the latter seems to have supplied its place. The dresses, for the most part, were those of the knights of former times, and the combatants (or, rather, competitors) were divided into two parties, usually according to their different nationalities. One of the favorite exercises in France consisted in running with a lance at the pasteboard head of a Moor or Turk, cutting it down with a sword, or firing at it with a pistol. Another of these tests of skill and horsemanship, if not of courage, consisted in carrying off on a lance a whole line of rings, which were suspended for the purpose. The carrousel in France was not known before the reign of Henry IV, but it had existed for some little time previously in Italy. There were brilliant carrousels under Louis XIII, and two celebrated ones were given in honor of Mademoiselle de la Vallière—the one in Paris in 1662, the other in Versailles in 1664. The place where the first of these fêtes was held has ever since been called the Place du Carrousel. A revival of the carrousel was attempted in Berlin in 1750, and in 1828 the cavalry school in Saumur held one in honor of the Duchess of Berry. In the United States the name is applied to a "merry-go-round," or movable platform fitted with wooden horses and other animals, on which children ride.

CARRUTHERS, kàr-rùth'èrz, ROBERT (1790–1878). A Scotch journalist and miscellaneous writer. He was born in Dumfries, Scotland, and in early life was apprenticed to a bookseller. In 1828 he became editor, and in 1831 proprietor, of the *Inverness Courier*. He is best known as the biographer and editor of Pope, his *Poetical Works of Alexander Pope* (1853), in 4 vols., with subsequent revisions, having been received with great favor. He was a friend of several of his eminent contemporaries, including Rogers, Macaulay, and Thackeray. In collaboration with Robert Chambers he published the *Cyclopædia of English Literature* (1843–44). His works include, also, a *History of Huntingdon* (1824) and an annotated edition of Boswell's *Journal of a Tour in the Hebrides* (1851).

CARRUTHERS, WILLIAM A. (c.1800–c.50). An American novelist, born in Virginia. He practiced medicine in Savannah, and wrote two romances dealing with Colonial times—*The Cavaliers of Virginia* (1834), a tale of Bacon's Rebellion, and *The Knights of the Horseshoe*

(1845), a tale dealing with Governor Spotswood's famous expedition. The latter book has been reprinted and was one of the best of the romances of its day. Carruthers also wrote *The Kentuckian in New York* (1834), a volume of sketches. Consult Trent, *Southern Writers* (New York, 1905).

CARS, RAILWAY. See RAILWAYS.

CARSON, ALEXANDER (1776–1844). A Scottish clergyman. He was born in county Tyrone, Ireland, was educated at Glasgow University, and in 1797 became pastor of a Presbyterian church in Tobermore, or Tubbermore, Ulster, Ireland. In 1805 he turned Independent, and finally (1831), after study of the New Testament for the purpose of refuting Baptist principles, he was converted to those very principles, and published *Baptism: Its Mode and Subjects*. Though agreeing with the Baptists in all other doctrines, he did not recognize "close" communion. Consult his *Life* by Moore (New York, 1853).

CARSON, CHRISTOPHER (generally known as "Kit Carson") (1809–68). A famous American hunter, trapper, and Western scout. He was born in Madison Co., Ky., but when only a year old was taken by his parents to Howard Co., Mo., where from 1824 to 1826 he served as a saddler's apprentice. In the latter year he accompanied a party of hunters to Santa Fe, N. Mex., and afterward devoted himself almost entirely to hunting and trapping. He accompanied an expedition to California in 1829, and another to the Rocky Mountains in the following year, and from 1832 to 1840 was employed as hunter for the garrison at Fort Bent, at the headwaters of the Arkansas. He accompanied Frémont on the latter's expeditions of 1842 and of 1843–44; then spent some time on a ranch, and in 1846–47 served as a guide in Frémont's famous expedition to California. In 1853 he, with a few Mexican drovers, succeeded in driving 6500 sheep to California, and on another occasion, this time unaided, he took 50 horses and mules to Fort Laramie, fully 500 miles from his ranch. In 1854 he was appointed Indian agent for the Utahs and Apaches, at Taos, N. Mex., and in this capacity was able, by reason of his remarkable influence over the Indians, to be of great service to the United States government. During the Civil War he served the government with great energy in New Mexico, Colorado, and the Indian Territory, especially against the Confederates in Texas and the Navajo Indians, and in 1865 was brevetted brigadier general. In the course of his career as a trapper, hunter, Indian fighter, scout, and Indian agent, he met with many remarkable adventures, some of which read like romance, and he soon came to be regarded throughout the country as the typical frontiersman, resourceful in danger, an adept with the rifle, and skilled even beyond the Indians in woodcraft and the knowledge of wild animals. Consult: Burdette, *Life of Kit Carson, the Great Western Hunter and Guide* (Philadelphia, 1869); Peters, *Kit Carson's Life and Adventures, from Facts Narrated by Himself* (Hartford, 1874); Bradley, *Winning the Southwest* (New York, 1912); Sabin, *With Carson and Frémont* (Philadelphia, 1912).

CARSON, RT. HON. SIR EDWARD HENRY (1854–). A prominent British barrister and statesman. He was born at Dublin, graduated from Trinity College, entered Parliament,

and in 1892 became Solicitor-General for Ireland. He was actively engaged on the side of the crown throughout the land troubles in Ireland, and became so closely identified with Unionist principles in the House of Commons that on Mr. Balfour's retirement he was spoken of as the leader of the Unionist party.

In 1912 Carson became by popular recognition the head and centre of the Ulster resistance to the Home Rule Bill for Ireland. (See *UNITED KINGDOM, History*.) Even before its introduction into Parliament Carson organized and presided over a huge mass meeting in Ulster, where from 80,000 to 100,000 men paraded in military array before Mr. Bonar Law, the Unionist leader, as an indication of forcible resistance to the government. The bill was introduced in Parliament on April 11, and Sir Edward Carson immediately became its foremost assailant throughout the memorable sessions of 1912-13. He was also indefatigable in Ireland, where, hailed as "general," he organized and reviewed Protestant volunteers. In Belfast he was given the Orange battle flag used by William III at the battle of the Boyne, and under it he signed, first of all the quarter million of Ulster men, the solemn covenant which pledged resistance to a Home Rule Bill for Ireland. In 1913 still more startling measures were taken. A provisional government for Ulster was determined upon, and Carson was put at the head of the Executive Committee, which in case of necessity was to administer Ulster. The Liberal government, apparently alarmed at this grim earnestness, made, in the autumn of 1913, a tentative proposal that Northeastern Ulster be excluded for the present from Home Rule. To this idea Carson remained unfriendly, although he agreed to abide by the majority of his fellow Irish Protestants, if they should approve the suggestion. Carson is a brilliant debater and so utterly without fear in both word and deed that many have looked for his arrest, while some of the suffragettes pointed out that the Ulster provisional army was as much a defiance of established government as was their propaganda.

CARSON CITY. The capital of Nevada and the county seat of Ormsby County, 31 miles by rail south of Reno, on the Virginia and Truckee Railroad (Map: Nevada, D 2). It is in a picturesque region, near the base of the Sierra Nevada, about 12 miles from Lake Tahoe, and contains the capitol, Federal building, library, orphans' home, and a branch mint, which receives immense deposits of silver and gold ore. The State prison is 2 miles southeast of the city, and a United States government Indian school is three miles to the south. Carson City is in a fertile agricultural region and is engaged principally in mining, stock raising, and agriculture. Founded in 1858, it became the capital of Nevada in 1861 and was chartered as a city in 1875. Pop., 1890, 3950; 1900, 2100; 1910, 2466.

CARSON RIVER. A stream in west Nevada. It rises in the Sierra Nevada Mountains, south of Lake Tahoe, and flows in a northeasterly course, passing a few miles to the south of Carson City (Map: Nevada, D 2). It is about 150 miles in length to where it divides, one branch flowing north and disappearing in Carson Sink, and the other flowing southward into Carson Lake, a small body of water which appears to have no outlet.

CARSTARES, kâr'stârz, or CARSTAIRS, WILLIAM (1649-1715). A Scottish statesman

and divine, born at Cathcart, near Glasgow, Feb. 11, 1649. He was the son of the Rev. John Carstares, an extreme Covenanter, and was tutored by Sinclair, minister of Ormiston, East Lothian. He distinguished himself at Edinburgh University and graduated in 1667. Two years later he went to Utrecht to study theology, and there his accomplishments attracted the notice of the Prince of Orange, whose lifelong friend and confidential adviser on English matters he became. He returned to England in 1674, and on suspicion of being part author of a pamphlet on Scottish grievances, was first committed to the Tower, then transferred to Edinburgh, and kept in prison until 1679. In 1682 he went to London and negotiated between the English and Scottish conspirators in the Rye House Plot. He was arrested and put to the torture of the thumbscrew, but only partly confessed, when assured that his depositions would not be used against any one. Unfortunately, his evidence, notwithstanding his strenuous expostulations, led to the execution of Baillie of Jerviswood (q.v.). He returned to Holland in 1685, and, acting mainly on his advice, the Prince of Orange planned and carried out the invasion of England in 1688. He accompanied the Prince as chaplain and, when the Prince was established as William III, effected a reconciliation between him and the Scottish church. From 1693 to 1702 he wielded great influence in Scottish affairs and, owing to his authority in Church matters, was nicknamed "Cardinal Carstairs." He was elected principal of the Edinburgh University in 1704 and used his influence to increase the patronage of Scottish colleges. In the same year he became minister of Greyfriars Church and was appointed moderator of the General Assembly, an office to which he was four times elected in 11 years. On a visit to London in 1707 he received a medal and the personal thanks of Queen Anne for his assistance in passing the Act of Union. He succumbed to an attack of apoplexy Dec. 28, 1715, leaving a reputation for scholarship, piety, charity, and political sagacity.

Consult McCormick, "Life of Carstares," prefixed to *State Papers and Letters Addressed to William Carstares* (London, 1774), and Story, *Character and Career of William Carstares* (London, 1874).

CARSTENS, kâr'stens, ASMUS (JAKOB ASMUS) (1754-98). A German painter and engraver. He was born at Sankt Jorgen (Schleswig), was early apprenticed to a wine merchant, and could not devote himself to art until the age of 22, when he enrolled at the Academy in Copenhagen. Refusing to follow the usual academic course, he educated himself by studying anatomy and the antique casts. In 1787 he came to Berlin, attracted notice with his drawing "The Fall of the Angels," and was made professor at the Academy. Finally, in 1792, he was able to realize his life's dream of going to Rome, where, in spite of continual illness, his best work was produced. The Weimar Museum possesses a fine collection of his cartoons and drawings, among them "Night with her Children" and "The Birth of the Light." Other important works are the "Argonaut" cycle of 24 plates (Copenhagen), "Priam and Achilles" (Berlin). Many of his drawings also represent scenes from Dante, Ossian, and Shakespeare. Carstens, by his noble drawings, was a worthy precursor of that revival of art in Germany which was to appear

later in the works of Cornelius and Overbeck. As a painter his rank is lower than as a draftsman; he is deficient in color and decorative facility. He followed a supposed Greek ideal, and his classical subjects represented qualities of simplicity and power that had been wanting in the works of his predecessors. Consult Fr. Pauli, *A. Carstens* (Berlin, 1876), and Fernow, *Carstens Leben und Werke* (new ed. by Riegel, Hanover, 1867).

CART (AS. *crat*, Icel. *kartr*, from Welsh *cart*, Ir., Gael. *cairt*, *cart*, dim. of *carr*, *car*). A two-wheeled vehicle, usually without top or springs, designed in most cases to carry heavy loads and to be drawn by one horse. The cart is doubtless the oldest, as it is the simplest, form of carriage. In its primitive form it consisted of a box or platform mounted on a rude axletree at whose extremities wheels, formed by making transverse sections from a tree trunk, revolved. To this axletree the poles or shaft were also fastened. The earliest chariots, though elaborately ornamented, were constructed on this simple plan. In modern times carts are used in many countries for agricultural purposes. The one-horse cart is employed by carriers all over Scotland. In France and Germany the carrier's cart is a somewhat heavier vehicle. Long in the body, very strong in construction, and poised on two high wheels with broad rims, this continental cart carries enormous loads. The *dump cart* is a vehicle so constructed that it can be unloaded by simply tilting the body of the vehicle. It is much used in the United States for hauling dirt from excavations and for the removal of ashes and garbage in cities. There is another class of carts or two-wheeled vehicles which are used for pleasure carriages. An example of this class is the *dogcart*, so called because it was originally made for the conveyance of sporting dogs. Such carts are particularly available for tandem driving (see **DRIVING**), and there are many types for both town and country use. An essential feature of a good dogcart is a mechanical or other device whereby the body or weight may be shifted on the frame so as to secure a proper balance and consequent ease of traction for the horse by removing the weight as much as possible from his back. The *gadabout* is a somewhat low form of dogcart, while the *White-chapel cart* is generally built of considerable height and is largely used for tandem driving. The *gig*, a two-wheeled cart with a single seat, modern types of which are known as *tilburys* and *stanhopes*, also belongs to this class. The *calash* of Canada, where the driver sits in a low seat in front of his fares, is one of the older forms of cart which still survive. The Irish *jaunting car*, where two seats are placed back to back lengthwise of the car, and directly behind the driver, is also well known. The *trotting sulky*, which, like the trotting horse, is a peculiarly American product, is another important type of two-wheeled vehicles. In 1892 the pneumatic tire and ball bearings which had been used with such success on the bicycle were applied to the trotting sulky, and the diameters of the wheels were reduced. The result was a material lowering of the trotting records. There are also numerous other types of two-wheeled carts known as *road carts*, which, while not possessing a high degree of comfort, are useful and convenient and are easy on the horse. Certain of these are specially designed for breaking colts and others for exercising trotting horses. For a

discussion of vehicles in general, see **CARRIAGE**; **DRIVING**; and consult the authorities there cited.

CAR/TAGE/NA, *Sp. pron. kár'tá-ná-na*. An important seaport and one of the chief naval stations of Spain, in the Province of Murcia, situated on a bay of the Mediterranean, 27 miles south-southeast of Murcia (Map: Spain, E 4). It is built partly on the slope of a hill and partly in a plain. The harbor is one of the best on the Mediterranean, capacious enough to hold the largest fleets, with a narrow entrance commanded by fortifications placed on the summits of two volcanic cliffs. There are other defenses nearer the city to the east and west. The city, which is surrounded by walls, is well built and has some wide and good streets, and several fine plazas, notably La Merced, La Constitución, and Del Rey. In the southeastern part of the city is the Castillo de la Concepción, at an elevation of over 225 feet, and of interest for its ruins and magnificent view. Among the more noteworthy structures are the Gothic cathedral, dating from the thirteenth century, which in the Middle Ages is said to have been one of the richest in Spain; the Hospital Militar, on a fine site overlooking the sea; the Hospital de la Caridad, which accommodates 600 patients; the Cuartel de Guardias Marinas, and the Presidio. The leading feature of the city is the arsenal, occupying a site on the southwest, which has an extensive equipment of foundries, machine shops, barracks, hospitals, dockyards, docks, etc., all of its facilities being on a large scale. A marine school also is maintained. Cartagena was, and in a sense still is, an episcopal see. In 1281 the see was transferred to Murcia and became officially and literally the see of Murcia-Cartagena; but after all these centuries it is still called most often Cartagena. The city contains a number of educational institutions, both public and private. Good water is supplied through a new aqueduct. With its suburbs Cartagena constitutes an important commercial and mining centre, and it is also the seat of considerable industrial interests. Lead, argentiferous ore, iron, manganiferous iron, and some copper and zinc are mined in the vicinity. There are extensive smelting works, glassworks, and manufactures of esparto grass wares, sailcloth, cordage, soap, pottery, liquors, etc. The tunny fishery and shipbuilding also are industries of importance. The commerce of the city consists of an export trade in minerals, esparto, oranges, and lemons, and imports of machinery, provisions, coal and coke, timber, etc. Pop., 1900, 99,871; 1910, 102,542.

Cartagena, anciently known as *Carthago Nova* and *Carthago Spartaria*, was founded in 228 B.C. by Hasdrubal. As the Carthaginian headquarters in Spain, it became a town of importance and had equal influence under the Romans after its capture by Scipio in 210 B.C. In 425 A.D. Cartagena was sacked by the Vandals; early in the eighth century it was taken by the Saracens. St. Ferdinand of Castile captured the city in 1244; but it was retaken, and not until it fell before the arms of James I of Aragon in 1276 did it come finally into Christian hands. In 1509 Cardinal Ximénez sailed from Cartagena on the famous expedition against Orán. In the War of the Spanish Succession it was taken (1706) by an English-Dutch fleet, but was recovered shortly afterward. It surrendered to the French in 1823. In the political struggles of the nineteenth century Cartagena played comparatively an unim-

portant part until 1873, when it proclaimed an independent cantonal government. The insurrection was soon put down, but not until the city had suffered a disastrous bombardment. As a naval station Cartagena suffered considerably in 1898 from the naval reverses of the Spanish-American War.

CARTAGENA, or CARTHAGENA. A fortified seaport and capital of the Colombian State of Bolívar, situated on a peninsula where the shore of the Caribbean Sea bends abruptly towards the south to form the Gulf of Darién (Map: Colombia, B 1). Its temperature averages 82° F., and its location is unhealthful. The city is surrounded by the old fortifications and possesses a cathedral, two fine churches, a government building, a college, seminary, and a theatre. The harbor is a good one, but has a difficult entrance and has lost its importance since the opening of the harbor at Sabanilla. The town manufactures chocolate and candles, and exports cattle, hides, fine woods, precious stones, and tobacco. Pop. (1905 official estimate), 14,000. Cartagena was founded by Dom Pedro de Heredia in 1533, and was an object of attack for English freebooters, who burned it under Drake in 1585; and in 1697 the French took it and obtained \$5,000,000, by way of ransom. It resisted an assault by the English in 1741, was captured by Bolívar, recaptured by Spain during the war for independence, 1815, and was retaken by the patriots in 1821.

CARTAGO, kâr-tâ'gô. The capital of the province of the same name in Costa Rica, Central America (Map: Central America, E 6). It lies about 14 miles southeast of San José, the capital, with which it is connected by rail. It is regularly built, but most of its public buildings bear marks of the earthquakes from which the city has suffered. The town has a considerable coffee trade, and derives much importance from its position on the interoceanic railway. Cartago was known in the sixteenth century, having been in existence as early as 1522. As the seat of government it attained to considerable prominence, and in 1823 is said to have contained 30,000 inhabitants. The civil wars and seismic disturbances, however, contributed to its decline, and the capital was moved to San José. Pop., 1903, 4536.

CARTAGO. A town of Colombia, in the Department of Cauca, on the Cauca River, 150 miles west of Bogotá (Map: Colombia, B 3). It has coffee, cocoa, and tobacco industries and a trade in cattle. Pop., 10,000.

CARTE, THOMAS (1686-1754). An English historian. He was a son of Samuel Carte, the antiquarian and divine, and was born at Clifton. He was educated at Oxford and took his B.A. degree in 1702, then proceeded to Cambridge and attained his M.A. in 1706. He received holy orders in 1707, and was appointed reader at the Abbey Church, Bath; but subsequently as a Stuart Loyalist refused allegiance to George I and resigned. Because he was secretary to Bishop Atterbury and a suspected accomplice in that prelate's conspiracy, £1000 was offered for his arrest, but he escaped to France. He was allowed to return in 1728, and in 1736 published a *Life of James, Duke of Ormonde* (2 vols.). In 1747-55 appeared his *History of England to 1654* (4 vols.), a valuable source for later historians. His other works include illustrations for the *History of Thuanus* (De Thou), edited by S. Buckley (7 vols., 1733); and 20

folio and 15 quarto manuscript volumes of valuable English historical remains to 1688 are preserved and have been much drawn upon in the Bodleian Library, Oxford. Carte died, April 2, 1754, at Caldecott House, near Abingdon. His *History of England* was republished at Oxford in 1851 (6 vols.). Consult Nichols, *Literary Anecdotes*, vol. ii (London, 1812-15), and his *Illustrations of Literary History* (London, 1817-58), vol. v, pp. 152-156.

CARTE BLANCHE, kârt blânsh (Fr., white paper). A blank paper authenticated with an authoritative signature and intrusted to some one to be filled up as he may think best. Thus, in 1649, Charles II tried to save his father's life by sending from The Hague to the Parliament a signed *carte blanche* to be filled up with any terms which they would accept as the price of his safety. The term has come to denote unlimited authority, freedom to do as one wills.

CARTEL, kâr-têl or kâr-tâl' (Fr., It. *cartello*, ML. *cartellus*, dim. of *carta*, paper). An agreement relative to the exchange of prisoners. A *cartel ship*, or *cartel*, is one commissioned to carry prisoners or proposals of any kind between belligerents, and is not permitted to carry an armament (except a gun for making signals), cargo, ammunition, military stores, or instruments of warfare. A violation of the conditions imposed renders a cartel ship liable to capture and confiscation.

CARTEL, THE. The agreement by which the German Conservatives, Imperialists, and National Liberals united in 1867 in support of Bismarck and the Army Bill. See **POLITICAL PARTIES, Germany**.

CARTELLIER, kâr-t'lyâ', PIERRE (1757-1831). A French sculptor, born in Paris. He studied under Bridan, first exhibited in the Salon of 1796, and was appointed member of the Institute and professor at the Ecole des Beaux-Arts in 1816. His principal works are: "Napoleon I" and the "King of Holland" in Versailles; "Archbishop Juigne" in Notre Dame, Paris; mausoleum of the Empress Josephine in the church of Rueil; the bas-relief of "The Capitulation at Ulm," Arc du Carrousel, Paris; and the allegorical statues "Force" and "Prudence" in the Pantheon. Among his numerous and important pupils were François Rude, Petitot, and the two Lesueurs. Consult the monograph by Eméric-David (Paris, 1836).

CARTER, ELIZABETH (1717-1806). An English poet and translator, born at Deal, Kent. She became an expert linguist, rendered into English De Crousaz's *Examen de l'essai de Monsieur Pope sur l'homme* (2 vols., 1739); Algarotti's *Newtonianismo per le dame*; and (1758) the works of Epictetus. Her poetry has slight value. She was a friend of many of the leading *littérateurs* of the time, including Johnson, to whose *Rambler* she contributed two papers.

CARTER, FRANKLIN (1837-1919). An American educator, born in Waterbury, Conn. He was educated at Yale, at Williams, and at the University of Berlin, and received several honorary degrees. He began his teaching career at Williams College, where he was professor of Latin and French from 1865 to 1868 and of Latin alone from 1868 to 1872. He was then professor of German at Yale from 1872 to 1881 and during this period studied theology and was licensed to preach. In 1881 he became president of Williams and administered the affairs of the college with great ability until 1901, when he

resigned. He became president of the Clarke School for the Deaf in 1896. His publications include an edition of Schiller's *Iphigenie auf Tauris* (1870), a *Life of Mark Hopkins* (1892), and various articles in the *New Englander* and in the *Transactions of the American Philological Society* and the *Modern Languages Association*.

CARTER, HENRY. See **LESLIE, FRANK.**

CARTER, JAMES COOLIDGE (1827-1905). A distinguished American lawyer, born in Lancaster, Mass. He graduated at Harvard in 1850 and in 1853 was admitted to the bar. He was appointed, in 1875, a member of the commission for devising a form of municipal administration for the cities of New York State, and in 1888 was a member of the constitutional commission. In 1892 he was appointed one of the counsel to present the claims of the United States before the Bering Sea tribunal. He was equally eminent for his skill as an advocate, his legal learning, and his fine public spirit, and for a dozen years before his death ranked as the leader of the New York bar. His publications include: *The Codification of our Common Law* (1883); *The Provinces of the Written and the Unwritten Law* (1889); *The Ideal and the Actual in the Law* (1890); *Law: Its Origin, Growth, and Function* (1907).

CARTER, JESSE BENEDICT (1872-). An American educator, born in New York City. He was educated at New York and Princeton universities and at the universities of Leipzig, Berlin, Göttingen, and Halle. He became instructor in Latin in 1895, assistant professor in 1898, and professor in 1902 at Princeton, and in the summer of 1900 he lectured at the University of Wisconsin on Roman religion. In 1904 he became professor of Latin at the American School of Classical Studies in Rome, and in 1907 director of the school. Besides translating *Huelsen's Forum* (1906), he is author of *De Deorum Cognominibus* (1898); *The Roman Elegiac Poets* (1900); *Epitheta Deorum* (1902); *Virgil's Æneid* (1903); *The Religion of Numa* (1906); *The Religious Life of Ancient Rome* (1911); *Memorial Service to J. Pierpont Morgan* (1913).

CARTER, LOUISE LESLIE (1862-). An American actress. She was born at Lexington, Ky., and made her début in 1890 in *The Ugly Duckling* at the Broadway Theatre, New York. She was a pupil of David Belasco, the author of the play. After having appeared as the Quakeress in the musical comedy of *Miss Helyett* (1891-93), she retired from the stage for a year and a half more of laborious study at her home in New York. Then, in 1895, as Maryland Calvert in *The Heart of Maryland* (produced at Washington, October 9), she made a sensation. In April, 1898, with the same play in London, she repeated her American success. In December, 1898, she made her appearance in an adaptation of *Zaza*, which began its long run in New York at the Garrick Theatre, Jan. 9, 1899. In December, 1901, she had another success in Belasco and Long's play, *Du Barry*, in which she continued for three years. In 1906 she severed her connection with Belasco and began a series of performances under her own management, playing in *Du Barry* and *Zaza* and a revival of *La Tosca* (1907). In 1910 she played in New York in *Two Women*. Consult *Strang, Famous Actresses of the Day in America* (Boston, 1899), and Clapp and Edgett, *Players of the Present*, Dunlap Society Publications (New York, 1899).

CARTER, SAMUEL POWHATAN (1819-91). An American naval officer and soldier, born in Elizabethtown, Carter Co., Tenn. He attended Princeton for a time, and entered the navy in 1840 as a midshipman. Subsequently he was assistant instructor of infantry tactics at the Naval Academy (1851-53) and assistant instructor in seamanship there (1857-61). As a naval officer he served in the Mexican War and at the capture of the Barrier Forts (q.v.) near Canton, China, in 1856. In 1861 he was transferred to the War Department and organized the troops from East Tennessee. In the army he served with distinction throughout the Civil War, being brevetted major general in 1865. He then returned to the navy and from 1869 to 1872 served as commandant of the Naval Academy at Annapolis. He retired from the service in 1881 and received the rank of rear admiral on the retired list in 1882.

CARTER, THOMAS HENRY (1854-1911). An American politician, born in Scioto Co., Ohio. He studied law, was admitted to the bar in 1882, and in the same year moved to Helena, Mont. In 1889-91 he was delegate for the Territory of Montana in Congress, and upon its admission to statehood was elected its first representative in Congress. For two years he was Commissioner of the General Land Office, and from 1892 to 1896 chairman of the Republican National Committee. He served as United States Senator in 1895-1901 and in 1905-11, and in the latter year was appointed a member of the international boundary commission of the United States and Canada. In 1901 he talked to death in a 16-hour speech the river and harbor bill with appropriations for \$50,000,000.

CARTER-COTTON, FRANCIS L. (1847-). A Canadian journalist and statesman. He was born and educated in Yorkshire, England. Emigrating to Canada, he settled at Vancouver, British Columbia, where in 1886 he founded the *Daily News-Advertiser* and became its editor. In 1890 he was elected a Conservative member of the British Columbia Legislature, and in 1898-1900 was Minister of Finance in the administration of Charles Augustus Semlin (q.v.). He was early interested in financial questions, his writings and speeches in this field making him a recognized authority in the province. In 1904-10 he was Chief Commissioner of Lands and Works, and afterward President of the Council, in the ministry of Sir Richard McBride (q.v.). His interest in higher education led him in 1906 to endow a professorship of pure and applied mathematics in the McGill University College of British Columbia. In 1902 he was elected first chancellor of the University of British Columbia.

CARTERET, SIR GEORGE (?-1680). An English Royalist, Governor of the island of Jersey, and one of the original Lords Proprietors of the province of New Jersey in America. He early went to sea and by 1633 had risen to the rank of captain in the English navy. In 1639 he became comptroller of the navy, and in 1643, having previously, on the outbreak of the Revolution, espoused the Royalist side, he succeeded his uncle as bailiff of the island of Jersey, and was also appointed Lieutenant Governor. He soon expelled the parliamentary forces from the island, and was created a knight and baronet in 1646; but was forced to surrender to the Commonwealth forces in 1651, and for

several years thereafter served in the French navy under Vendôme. Returning to England at the time of the Restoration, he became a member of the Privy Council and Treasurer of the Navy, which latter position he held from 1661 to 1667, when he became Deputy Treasurer of Ireland. He took an active interest in the colonization of America, and in 1650 was granted "a certain island and adjacent islets in America in perpetual inheritance, to be called New Jersey," though no settlement was made at that time. In 1663 he was one of the original proprietors of Carolina, and in the following year the Duke of York granted to him and to John, Lord Berkeley, the territory now included in the State of New Jersey, the name *Nova Cæsarea*, or New Jersey, being given to the province in honor of Carteret's administration of Jersey. The proprietors received full governmental powers and were to pay an annual rental of one peppercorn, if legally demanded. After the surrender of the province by the Dutch in 1674, a regrent was made, this time with governmental reservations and limitations. On the division of New Jersey in 1676 Carteret became sole proprietor of East Jersey, which province he left by his will to his widow and to several designated trustees, by whom in 1682, in consideration of £3400, it was transferred to 12 purchasers, who combined with 12 others to form the "Twenty-four Proprietors of East New Jersey."

CARTERET, JOHN, EARL GRANVILLE (1690-1763). A British orator and statesman, born April 22, 1690. His father, first Baron Carteret of Hawnes, died in 1695, and he succeeded to the peerage at five years of age. He was educated at Westminster School and Christ Church, Oxford; in 1706 was created D.C.L., and, according to Dean Swift's humorous assertion, carried away more Greek, Latin, and philosophy than became a person of such high rank. He took his seat in the House of Lords in 1711, spoke in favor of the Protestant succession, received the notice of George I., and obtained some lucrative appointments. In 1719 he was Ambassador Extraordinary to Sweden, and in 1720 negotiated peace between Sweden, Prussia, and Hanover. In 1721 he was appointed Secretary of State, and in this capacity defended the proceedings of the government in the Atterbury conspiracy. In 1724 he became Lord Lieutenant of Ireland, and was in frequent consultation about public affairs with Dean Swift, who, in spite of numerous disagreements, praised his rule. His lord-lieutenancies (1724-26 and 1729-30) were particularly popular. From 1730 to 1742 he was one of the most determined leaders of the opposition in the House of Lords against Robert Walpole, and on his displacement was made a Secretary of State. He became Earl Granville at his mother's death in 1744. The same year he had to resign his seals of office, but continued to receive marks of royal favor, and in 1749-50 was elected and installed Knight of the Garter at Windsor. From 1751 to his death, Jan. 2, 1763, he was Lord President of the Council under Henry Pelham. Carteret was generally admired for his handsome presence, his classical and oratorical attainments, and for his patriotism, wit, and conviviality; but his opponents, including Pitt, hated him for his haughty contempt of their opinions. Consult: Ballantyne, *Lord Carteret: A Political Biography* (London, 1887); Lecky, *History of England in the Eight-*

eenth Century (New York, 1878-91); and Mahon, *History of England*, vols. ii-iv (London, 1836-54).

CARTERET, PHILIP (?-1682). First proprietary Governor of New Jersey, appointed by Sir George Carteret and Sir John Berkeley, Lords Proprietors, in 1664. He arrived in August, 1665, at the site of Elizabethtown, which settlement he founded and named in honor of Sir George Carteret's wife, and exerted himself to secure emigrants from the New England Colonies by circulating among them the liberal "concessions" granted by the proprietors. With the exception of 1673-74, when the western part of New Jersey was held by the Dutch, he acted as Governor of the whole province until its division into East Jersey and West Jersey in 1676, after which, until his death, he was Governor of East Jersey. The early part of his administration was marked by conflicts with Sir Edmund Andros, Governor of New York, who claimed that New Jersey belonged under his own jurisdiction.

CARTERET, PHILIP (?-1796). An English naval officer and navigator. In 1766 he reached the rank of commander, and in the same year sailed in command of the *Swallow*, in the expedition sent out under Capt. Samuel Wallis for the exploration of the Southern Hemisphere, a work that had been started by Byron. On April 11, 1767, while clearing the Straits of Magellan, he became separated from the *Dolphin*, the other vessel of the expedition. He thereupon proceeded in his unseaworthy ship, discovered Pitcairn Island and the Queen Charlotte Islands, explored the strait (named by him St. George's Channel) between New Britain (now Neu Pommern) and New Ireland (now Neu Mecklenburg), and corrected errors made in the survey of Mindanao. In 1794 he was retired from active service with a commission of rear admiral. In view of his small resources and many difficulties, he accomplished much for geographical discovery. His interesting journal is to be found in Hawkesworth, *An Account of the Voyages Undertaken for Making Discoveries in the Southern Hemisphere* (3 vols., 1773). His other writings are *The Inhabitants of the Coast of Patagonia* and *Account of Camelopardalis Found at the Cape of Good Hope*.

CARTEROMACO, kār'tā-rō-mā'kō. See FORTEGUERRI, NICCOLÒ.

CARTERSVILLE. A city and the county seat of Bartow Co., Ga., 48 miles northwest of Atlanta, on the Western and Atlantic, the Nashville, Chattanooga, and St. Louis, and the Seaboard Air Line railroads (Map: Georgia, B 1). It is in a stock-raising and agricultural region, in which cotton, grain, and fruits are produced; there are valuable deposits of iron, manganese, gold, ochre, graphite, and other minerals; and manufactures of cotton goods, fertilizers, and cottonseed oil. The city contains a courthouse and library and owns its water works and electric light plant. In 1911 it adopted the commission form of government. Pop., 1900, 3135; 1910, 4067.

CARTERVILLE. A city in Williamson Co., Ill., 102 miles by rail southeast of St. Louis, Mo., on the Illinois Central and the St. Louis, Iron Mountain, and Southern railroads (Map: Illinois, C 6). The chief industry of the city is coal mining. Pop., 1900, 1749; 1910, 2971.

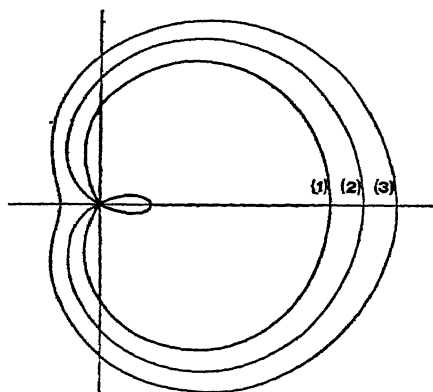
CARTERVILLE. A city in Jasper Co., Mo., 10 miles west by south of Carthage, the

county seat, on the Missouri Pacific and the Frisco Lines railroads (Map: Missouri, B 4). It is the centre of a highly productive zinc-silicate and lead-mining district, and has boiler works, ironworks, foundry and machine shops, stone quarries, etc. Cartersville was settled in 1875. Pop., 1900, 4445; 1910, 4539.

CARTESIANISM. The system of philosophy advocated by Descartes (q.v.) and his followers. (See GEULINCKX; MALEBRANCHE; AUNAULD, ANTOINE.) Spinoza and Leibnitz had their point of departure in Cartesianism, but introduced modifications so significant that they are not generally reckoned in the school. The literature of the subject is enormous. Consult especially: Bouiller, *Histoire de la philosophie Cartésienne* (3d ed., Paris, 1868); Kuno Fischer, *Geschichte der neueren Philosophie*, Bd. I translated by J. P. Gordy, under the title of *Descartes and his School* (New York, 1887); Höffding, *History of Modern Philosophy*, Eng. trans. (London and New York, 1900); Windelband, *History of Philosophy*, Eng. trans. (New York, 1908); N. Smith, *Studies in the Cartesian Philosophy* (London, 1902). See also bibliography under DESCARTES.

CARTESIANS, *kär-tē-zhāns*. The name of a group of curves discussed by Descartes in connection with the study of optics. In general they are curves of the fourth order, having two cusps. Common forms of these curves are the cardioid and limaçon (qq.v.). The Cartesian equation $(x^2 + y^2 - px)^2 = m^2(x^2 + y^2)$ shows the relation between these special forms.

The first case gives the curve marked (1), a limaçon; the second case gives the curve marked (2), a cardioid; and the third the curve marked (3), an outer oval. The Cartesians consisting of double ovals are curves of the sixth class;



- (1) If $p > m$, the origin is a double point.
- (2) If $p = m$, the origin is a cusp.
- (3) If $p < m$, the origin is a conjugate point.

those which reduce to limaçons are of the fourth class; and those which reduce to cardioids are of the third class. A curve in space defined as the locus of a point whose distances from three fixed points are connected by two linear relations is called a twisted Cartesian. See also CASSINI; CASSINIAN OVAL.

CARTESIUS. See DESCARTES.

CARTHAGE (Lat. *Carthago*, Gk. *Καρχηδών*, *Karchidōn*). A great city of antiquity on the north coast of Africa, situated in about lat. 36° 50' N. and long. 10° 20' E., near the modern Tunis, on a peninsula extending into a small

bay of the Mediterranean Sea. Recent excavations have shown that the city was laid out with streets regularly crossing each other at right angles. The long streets ran about 45 meters apart, parallel to the quays. Dido (q.v.) was its legendary founder, but it was probably a trading post established by merchants of Utica and Tyre. The native name of the city seems to have been Kart Hadshat, the 'new town,' probably with reference to Tyre, which the Carthaginians recognized as their mother city. Unfortunately, we know very little of the growth of Carthage. Our information begins after Carthage had become one of the greatest commercial cities of the world, and is even then scanty and one-sided, coming chiefly from the enemies of Carthage. The number of inhabitants in 149 B.C., just before the Third Punic War, is said to have been about 700,000. The population was partly of Phœnician, partly of Libyan descent. By the subjugation of the Libyan tribes, and by the ultimate annexation of other older Phœnician colonies, with which they had at first been simply in alliance, such as Utica, Hadrumetum, Hippo, the two Leptæ, etc., the Carthaginians extended their territory in the middle of the fifth century B.C. southward to Lake Triton, eastward to the Great Syrtis, and westward to the Atlantic. At first Carthage was essentially a mercantile city, and even paid a ground rent to the Libyan tribes until the fifth century. It was the maritime power of the Carthaginians which enabled them to extend their settlements and conquests to the other coasts of the Mediterranean. At the beginning of the sixth century B.C., Carthage appears as the ally of the Phœnicians in Sicily, now crowded by the Greeks into the western part of the island. After checking the Greek advance and founding colonies of their own, the Carthaginians reduced the coasts of Sardinia. Hanno (q.v.) founded colonies on the west coast of Africa beyond the Straits of Gibraltar, and Himilco visited the coasts of Spain and Gaul.

With the establishment of this control over the western Mediterranean, Carthage also established her trading policy. No foreign traders were allowed at any of her western colonies, and only the harbors of Carthage were open to foreign ships. All traders found elsewhere were drowned. This policy led the Carthaginians to form an alliance with the Etruscans, and in 540 B.C., in the battle of Alalia, they checked the attempts of the Greeks to encroach upon their territory. Massilia (Marseilles) alone held its position on the coast of Gaul. The first treaty with the Romans was concluded in 509 B.C., the second in 348 B.C., the third in 306 B.C. The connected history of Carthage begins with the fifth century B.C., a period of wars between the Carthaginians and the Greeks in Sicily. The Carthaginian army under Hamilcar was destroyed by Gelon, at Himera, in 480 B.C., and for a time the Greeks were free from attack. In 410 B.C. wars broke out anew, and the Greek cities of the southern coast of Sicily were plundered and destroyed. At Syracuse pestilence compelled the Carthaginians to raise the siege, and, under the leadership of Dionysius I, the tyrant of Syracuse, the Greeks recovered much of their lost territory. After several unsuccessful attempts to drive the Carthaginians from the island, Dionysius in 383 B.C. made a treaty which gave them the land west of the river Halycus. A later invasion of the Carthaginians was

repelled by Timoleon in 339 B.C., but 30 years later, when Agathocles was tyrant of Syracuse, the war began again, and Syracuse was once more besieged. Deserting his city, Agathocles crossed to Africa and for three years ravaged the almost defenseless territory of Carthage, though not strong enough to attack the city. After his death the Carthaginians again increased their dominions in Sicily. Although Pyrrhus contended successfully against them at first, he left that island entirely in 275 B.C.

The subjugation of southern Italy by the Romans brought the two great conquering nations into collision, and the First Punic War arose (264 B.C.), and, after a great naval victory of the Romans, terminated in 241 B.C.; the Carthaginians gave up Sicily and paid to the Romans a large sum of money. Soon a mutiny of the hired troops of Carthage, combined with an insurrection of the Libyan tribes, the ancient inhabitants of the country, who were kept down by the arbitrary rule of the Carthaginian colonists, threatened the entire ruin of the city. Hamilcar Barca brought this bloody war to a successful termination, but Carthage, crippled by the struggle, was unable to prevent the Romans from seizing Sardinia and Corsica. About 236 B.C. Hamilcar Barca led an army to Spain, where he, and after him his son-in-law, Hasdrubal, obtained great successes. Here was founded New Carthage, now Cartagena. After Hasdrubal's death (221 B.C.), Hannibal (q.v.), burning to avenge the defeat which his native city had sustained from the Romans, attacked and took Saguntum, a city on the Ebro, allied with Rome (219 B.C.). Thus began the Second Punic War, in which Hannibal pursued his career of conquest from Spain, through Gaul, and across the Alps into Italy itself, defeated the Romans with terrible slaughter in various battles, especially that at Cannæ, and brought Rome to the very brink of ruin. Yet the war terminated in the total defeat of the Carthaginians by Publius Cornelius Scipio, who overthrew their power in Spain and was victorious over Hannibal in the final and decisive battle of Zama, in Africa, in October, 202. A peace was then concluded, in which the Carthaginians were limited to their African territories, while most of their ships of war and war elephants were taken from them, besides an immense sum of money, and they were bound not to make war without permission of the Romans. Masinissa, King of Numidia, skillfully availed himself of dissensions which arose within Carthage between the nobles and the people, to advance his own interests at the expense of the Carthaginians; and as they (151 B.C.) opposed him and drove his adherents out of the city, the Romans seized the opportunity for a new declaration of war (149 B.C.), on the ground that the treaty was broken, and after a siege of two years Carthage was taken by Publius Cornelius Scipio Æmilianus (146 B.C.). For six days the combat was maintained in the streets of the city, and for 17 days the work of its destruction by fire was carried on by the conquerors. The country became a Roman province. Gaius Gracchus sent out 6000 colonists to found a new city on the site of Carthage. It was called Colonia Junonia Cathago, but it did not prosper. Augustus, carrying out the intention of his great uncle, restored the city in 29 B.C. In the second and third centuries of the Christian era the new Carthage had become one of the finest cities of the Roman Empire. In 439

Genseric made it the capital of the Vandal Kingdom; Belisarius conquered it in 533 and named it Colonia Justiniana Carthago; the Arabs under Hassan utterly destroyed it in 647; and now only two or three small hamlets and a few ruins mark its site. As the result of various excavations, especially those conducted by the French, under Père Delattre, remains of the ancient walls and of the harbors have been found; the citadel (called Byrsa), the forum, the amphitheatre, etc., have been more or less completely excavated. Many graves of Punic and Roman times, yielding many inscriptions and smaller objects, have been opened.

We have no satisfactory accounts of the constitution of the Carthaginian state. It was highly esteemed by Aristotle, but his account of it has perished, and our information is scattered. At the nominal head were two *suffetæ* (Hebrew, *shofetim*, 'judges' in the Bible), who seem to have been chosen annually by the people on nomination of the Senate. The nobles, who needed money more than birth to maintain their position, seem to have formed a Senate of 300, from whom a body of 30 (including the *suffetæ*) were chosen to carry on the ordinary government. Later we hear of the introduction of a body of 104 judges, who seem to have had supreme power over all officials, including the generals, and to have become the real rulers of the state. There was a popular assembly, composed of those citizens who had a certain property qualification. The Carthaginian oligarchy, while despising the multitude, was itself split up into factions and torn by family jealousies. On the other hand, the government, though undoubtedly oppressive to its subjects, was remarkably free from revolution or even popular uprising.

The Carthaginian army was raised from the conscription of the subjugated Libyans, from the hired Numidians, and mercenaries from Spain, Gaul, and, indeed, all parts of the world. The soldiers had no interest in the state, but were capable of becoming strongly attached to their generals, and in good hands were a formidable force, as is seen in the successful campaigns of Hamilcar Barca and Hannibal. In the time of Agathocles the city sent forth 40,000 heavy-armed infantry, 1000 cavalry, and 2000 war chariots, but the state could easily raise 100,000 troops. The fleet in the First Punic War consisted of 350 ships, carrying 150,000 men. The revenue needed to cover the enormous expense her military and naval organization involved was, in all likelihood, derived from tribute imposed on subject Libyan or Numidian races, in great part from mines in Spain, and from import duties derived from her maritime and inland trade, which was prodigious. Her merchantmen visited every coast and island of the Mediterranean and even ventured as far as the Azores, Britain, the Baltic, etc.; her caravans penetrated through Sahara to the gold-producing districts of the Niger, and through the Libyan Desert to the lands along the Nile. Still, Carthage was by no means an exclusively mercantile state. Many of her wealthiest citizens derived their income from large estates cultivated by bands of slaves, and the only Punic literature the Romans thought worth preservation was a treatise on agriculture by Mago, which was translated into Latin by order of the Senate, for the benefit of the Roman husbandmen.

The religion of the Carthaginians appears to

have been substantially the same as that of the Phœnicians—a worship of the stars and of fire. Moloch was the chief deity, and to him children and captives were sacrificed. The highest natural manifestation of this deity was the sun. Besides Moloch, the Carthaginians worshiped the Tyrian Melcart; Astarte, the moon goddess; Esmun, also called Asclepius by the Greeks; and a few of the Greek divinities, of whom a knowledge had been obtained in Sicily. It does not appear that there was a distinct sacerdotal order in Carthage. Probably religious ceremonies were performed by the dignitaries of the state, but our knowledge on this point is too meagre to permit any definite conclusion. Consult: A. Church, *Carthage, or the Empire of Africa* (New York, 1886); R. B. Smith, *Carthage and the Carthaginians* (London, 1877); Meltzer, *Geschichte der Karthager* (Berlin, 1879, 1896, 1913); Audollent, *Carthage romaine* (Paris, 1901); N. Davis, *Carthage and her Remains* (London, 1861); E. de Sainte-Marie, *Mission à Carthage* (Paris, 1884); *Atlas archéologique de la Tunisie* (Paris, 1893); Moore, *Carthage of the Phœnicians in the Light of Modern Excavation* (London, 1905). For recent discoveries, see *Comptes Rendus de l'Académie des Inscriptions et Belles Lettres*, vol. xxviii (Paris, 1901), and the map published in 1907 by the French Ministère de l'Instruction Publique.

CARTHAGE. A city and the county seat of Hancock Co., Ill., 32 miles south of Burlington, Iowa, on the Chicago, Burlington, and Quincy and the Wabash railroads (Map: Illinois, A 3). It is the seat of Carthage College (Lutheran), opened in 1872, and contains the jail in which the Mormon prophet, Joseph Smith, was killed in 1844. Settled in 1837, Carthage was chartered as a city in 1883. The water works are owned by the city. Pop., 1900, 2104; 1910, 2373.

CARTHAGE. A city and the county seat of Jasper Co., Mo., 20 miles east of Joplin, on the Missouri Pacific, the St. Louis and San Francisco, and the St. Louis, Iron Mountain, and Southern railroads, and on Spring River (Map: Missouri, B 4). The city has two parks, a fine county courthouse, and a Carnegie library. It has lead and zinc mines, stone quarries and limekilns, flour mills, and bed-spring, gate, broom, ice, and extract factories. The principal articles of export are stone, marble, grain, flour, fruit, poultry, and live stock. Settled in 1833, Carthage was destroyed during the Civil War and was entirely rebuilt after 1866. It was incorporated in 1873 and is governed under a charter of 1890, providing for a mayor, elected every two years, and a city council. The electric light plant and water works are owned and operated by the municipality. On July 5, 1861, a force of about 3500 Confederates, under Generals Jackson and Price, met a Union force of about 1500, under General Sigel, 7 miles east of Carthage, and in the battle which ensued the former lost about 200, and the latter about 50, in killed and wounded. After several hours of fighting General Sigel, to prevent the Confederate cavalry from outflanking him and cutting off his baggage train, fell back in good order to Carthage. Pop., 1890, 7981; 1900, 9416; 1910, 9483; 1920, 10,068.

CARTHAGE. A village in Jefferson Co., N. Y., 18 miles east of Watertown, on the New York Central Railroad, and at the terminus of the Black River Canal (Map: New York, E 3). It is on the east bank of the Black River, con-

nected by a State bridge with West Carthage, a separately incorporated village, with which it forms a single community. There are a public library, several large paper mills, machine shops, foundries, and ice plants, and it manufactures furniture, map sticks, duster handles, sashes, doors, blinds, pulp, bricks, etc. The water works are owned by the village. Pop., 1900, 2895; 1910, 3563. Pop., West Carthage, 1900, 1135; 1910, 1393.

CARTHAGE. Formerly a town in Hamilton Co., Ohio, now annexed to Cincinnati. It is the seat of the Hamilton County Infirmary and the Longview Hospital for the Insane. There are manufactories of automobiles, soap, springs and axles, and steel. See CINCINNATI.

CARTHAGENA, *Sp. pron.* kār'tā-hā'ná. See CARTAGENA.

CARTHAGO. See CARTHAGE (in Africa).

CARTHA'GO NO'VA, or **SPARTA'RIA**, *Spain.* See CARTAGENA.

CARTHAMINE (Fr. *carthamine*, from Neo-Lat. *Carthamus*, from Ar. *qirtim*, *qurtum*, *Carthamus*, from *qartama*, to cut off), $C_{44}H_{56}O_7$. A natural dye obtained by a chemical process from safflower (*Carthamus tinctorius*) in crystals which are insoluble in water, but slightly soluble in alcohol and ether. When freshly precipitated, carthamine immediately and permanently attaches itself to cotton or silk (but not to wool) requiring no mordant, dyeing the fabric a fine red, which is changed to yellow on the addition of alkalies and may be returned to red again on being treated with acids. When fused with caustic potash, it is transformed into para-oxy-benzoic acid.

CARTHUSIANS. A monastic order which owes its origin to St. Bruno (q.v.), who retired in 1086, with six companions, to the solitude of La Chartreuse (whence the name), near Grenoble, where they built hermitages, wore rude garments, and lived upon vegetables and coarse bread. The fifth prior, Guigo (died 1137), composed a body of rules, called the *Statuta Guigonis*, or *Consuetudines Cartusiæ*, but they have often been changed. After 1170, when the order received papal approbation, it extended rapidly. It dates from 1180 in England, where the name of Chartreuse Houses was corrupted into Charter Houses. The order is now conducted under the rules approved in 1682 by Pope Innocent XI. The Carthusians were divided into two classes—fathers (*patres*) and lay brothers (*conversi*). Each father occupied a separate cell, with a bed of straw, a pillow, a woollen coverlet, and the means of manual labor or of writing. They left their cell, even for meals, only on festivals and on days of the funeral of a brother of the order. Thrice a week they fasted on bread, water, and salt, and there were several lengthened fasts in the year. Flesh was forbidden at all times, and wine, unless mixed with water. Unbroken silence, except on rare occasions, was enforced, as well as frequent prayer and night watching. These austerities were continued, with little modification, by the modern Carthusians. The order at one time counted 16 provinces and boasted of the most magnificent convents in the world—as La Grande Chartreuse (see CHARTREUSE, LA GRANDE), in France, and in Italy the Certosa di Pavia, 18 miles south of Milan. The buildings of the former date from 1676. The buildings of the latter date from 1396, but are now preserved only as a national monument. The Carthusians

were given to hospitality and works of charity, and were, on the whole, better educated than the mendicant orders. Their principal seats were in Italy, France, and Switzerland; but they have shared the fate of the other monastic establishments, and their convents are now, for the most part, solitudes indeed. In 1900 they had 11 monasteries in France and 9 in other parts of Europe. The French houses have been suppressed, but four others opened in Italy and Spain. The Carthusian nuns arose at Salette, on the Rhone, in France, about 1229. They followed the rules of the Carthusian monks, but with some mitigations, of which the most notable is that they have a common refectory. When the monasteries were suppressed under Henry VIII, there were nine Carthusian monasteries in England. To-day there is one, near Steyning, 8 miles northwest of Brighton. See CHARTERHOUSE.

CARTIER, kār'tyā', SIE GEORGE ETIENNE (1814-73). A Canadian statesman. He was born at St. Antoine, in the Province of Lower Canada (now Quebec), was educated at the College of St. Sulpice, Montreal, and was admitted to the bar in 1835. He took part in the rebellion of 1837-38 and fled the country to avoid arrest, but after public feeling began to subside, he returned and resumed his law practice, which rapidly increased. He was keenly interested in the issues which resulted in the legislative union of Upper and Lower Canada in 1841, and in 1848 he was elected a Conservative member of the Legislative Assembly. He had modified his radical opinions and thenceforth adhered to the Conservative party. In 1856 he became Provincial Secretary, and in the same year was appointed Attorney-General for Lower Canada in the cabinet of which Sir Etienne Taché (q.v.) and John Alexander Macdonald (q.v.) were the chief members. Cartier became the firm political associate of the latter and was recognized as the leader of the Conservative party in Lower Canada. In 1858 the Macdonald-Cartier ministry obtained power, with the former as Premier; but in August of the same year, after a defeat which enabled the succeeding ministry of George Brown (q.v.) to hold office for two days, the two Conservative leaders returned to power as chiefs of the Cartier-Macdonald ministry, with Cartier as Premier,—an episode marked by a questionable interchange of portfolios and popularly characterized as "the double shuffle." Cartier's legislative career was notable for his part in abolishing seigniorial tenure and in secularizing the clergy reserves. (See CANADA, *History*.) He also vigorously supported railway building, procured the codification of the civil laws of Lower Canada and the establishment of normal schools. In the large issues which resulted in confederation in 1867 he took a strong interest. In 1865 he was one of the delegates to England to discuss that question with the Imperial government, and subsequently threw the weight of his influence to bring his province into the federal union. During the greater part of the first administration of Sir John A. Macdonald (1867-73) he was Minister of Militia and Defense; but in 1872 he was defeated in an electoral contest, and in failing health left for England, where he soon died. Consult Dent, *Canadian Portrait Gallery* (Toronto, 1880), and the *Life* by A. O. DeCelles (Toronto, 1904).

CARTIER, JACQUES (1494-c.1557). A French

explorer, born at Saint-Malo. He acquired a reputation as a bold navigator and was selected by Admiral Chabot to lead an expedition to the northeastern coast of North America for the purpose of discovering a passage to Cathay. With two ships he sailed from Saint-Malo in 1534. He sighted Newfoundland, near Cape Bonavista, and followed the coast southward to a point nearly opposite Cape Breton; then, turning westward, made Prince Edward Island and gave its name to the Bay of Chaleur. He then skirted the northern coast of Anticosti Island and returned along the shores of Labrador. At Cape Gaspé he landed, erected a cross, and took possession of the country in the name of France. The next year, with another fleet, under the royal commission, he sailed up the St. Lawrence. Leaving his ships moored near the Indian village of Stadacona, on the site of the modern Quebec, Cartier, with a few followers, pushed on to the fortified village of Hochelaga, which lay at the foot of an imposing hill called by the explorer Mount Royal (Montreal). The late season—it was October—made it imprudent to proceed farther. He returned to his ships and spent the winter amid much suffering from cold and illness among his crew. When spring came, the adventurers sailed for home, taking with them the Indian chieftain of Stadacona, whom they had kidnapped. Cartier's account of this voyage has survived and is known as the *Bref Récit*. European complications absorbed the immediate attention of the French King, but four years later (1540) he sent out to the New World Jean François de la Roche, Sieur de Roberval, as viceroy. Cartier was made captain general and pilot of the fleet. Owing to some delay in the equipment of the expedition, Cartier set sail with but three ships, in May, 1541. After waiting for Roberval in vain for six weeks on the coast of Newfoundland, he proceeded up the St. Lawrence and in August found himself once more at Stadacona. He fortified a position near Cape Rouge and called the post Charlesbourg. Two of his ships were sent back to meet Roberval, concerning whose movements the evidence is confused when not contradictory. What seems certain is that the viceroy and his fleet were off Newfoundland in June, 1542, and that he there met with Cartier, who was returning to France after the winter at Charlesbourg, taking with him what he erroneously supposed to be gold ore. He had seen little of the Indians during the winter. Cartier was well received by his sovereign, who presented him with a manor near his native town. Lescarbot tells us that Cartier made a later voyage to rescue Roberval; but if so, no data exist respecting it. The principal authority concerning Cartier is François Joüon des Longrais, *Jacques Cartier* (Paris, 1888), which contains the important documents throwing light on his career. For shorter biographies of Cartier, consult: Joseph Pope (Ottawa, 1890); Hiram B. Stephens (Montreal, 1890); N. E. Dionne (Quebec, 1889); Baxter, *Memoir of Jacques Cartier* (Portland, 1906). For studies of Cartier's route, see also *Transactions of the Royal Society of Canada* (Ottawa, 1897).

CARTILAGE (Fr., from Lat. *cartilago*, gristle). A firm elastic substance of a pearly whiteness, presenting to the unaided eye a uniform and homogeneous appearance. Cartilages may be divided into the *temporary* and the *permanent*. The *temporary* cartilages are

substitutes for bone in the earlier periods of life and after a certain time become replaced by bone. (See BONE.) At birth the extremities and larger eminences of the long bones and the margins of the flat bones are still cartilaginous, and this cartilage does not altogether disappear till the period of puberty. The permanent cartilages are either *articular* or *non-articular*. *Articular* cartilages are attached to the extremities of bones and enter into the formations of joints. *Nonarticular* cartilages are usually more flexible than the articular. They are sometimes attached to bones, to lengthen them out, as, for instance, in the nose or the auditory canal. (See EAB.) In other cases they form the basis of distinct organs, as the larynx, the trachea, and the eyelids.

Cartilage belongs to the group of tissues termed connective tissues. The matrix or intercellular portion of cartilage is dense and firm, and the different varieties of cartilage are recognized by the nature of the matrix. In the variety called *hyaline cartilage* the matrix is apparently homogeneous, though Leidy has shown that it is really composed of bundles of fine fibrous connective tissue. Lying in this matrix are the cartilage cells. These are oval or irregular, granular, nucleated bodies, and are arranged singly, in pairs, or in fours. The cartilage cell or group of cells is surrounded by a clear cell space. Hyaline cartilage makes up the skeleton in the embryo, and in it the bones of the body, with the exception of those of the head and face, are developed. In the adult it is found as articular cartilage, the cartilages of the nose, Eustachian tube, larynx, trachea, bronchi, costal cartilages, etc. In the variety called *fibrocartilage* the matrix is composed of fibrous connective tissue, in which are imbedded the cartilage cells. These cells may occur singly or are more commonly arranged in rows of two or more, lengthwise of the bundles of fibres. Fibrocartilage is found in the intervertebral disks and around the edges of some joints. In the variety called *elastic cartilage* the matrix is rich in elastic fibres, giving the tissue a glistening yellow appearance. The cells occur singly or in pairs, resembling the arrangement noted in hyaline cartilage. Some of the smaller cartilages of the body are of this variety, the epiglottis, part of the Eustachian tube, the external auditory canal, the arytenoid cartilages, etc.

CARTILAGINOUS FISHES. See ELASMobranchii; FISH.

CARTOGRAPHY. See MAP; CHART; SURVEYING.

CARTOMANCY. See SUPERSTITION.

CARTON, R(ICHARD) C(LAUDE) (1856-). An English actor and dramatist, whose real name was R. D. Critchett. For a time he was on the stage in Bristol and in London. He collaborated with Cecil Raleigh on *The Great Pink Pearl* (1885), *The Pointsman* (1887), and *The Treasure* (1888). His sentimental manner in his own plays was exhibited in *Sunlight and Shadow* (1890) and in *Liberty Hall* (1892; revived, New York, 1913). His later light comedies, criticized for an artificiality of diction, include: *The Home Secretary* (1895); *The Tree of Knowledge* (1897); *Lord and Lady Algy* (1898); *The Ninth Waltz* (1900); *A Clean Slate* (1902); *The Rich Mrs. Repton* (1904); *Lorimer Sabiston, Dramatist* (1909); *The Bear Leaders* (1911).

CARTON, SYDNEY. A character in Dickens's *Tale of Two Cities*, the friend of Charles Darnay, for whom he renounced his love for Lucy Manette and in whose stead he was guillotined.

CARTOON' (Fr. *carton*, from Lat. *carta*, paper). A design, on strong paper, of the full size of a work to be afterward executed in fresco, oil, tapestry, mosaic, or stained glass. The object of the artist in preparing a cartoon is to adjust the drawing and composition of his subject in circumstances in which alterations can be effected with facility, before proceeding to the execution of the work itself. Cartoons are generally composed of a number of sheets of stout paper pasted together at the edges and stretched on a frame. The cartoon, when finished, is transferred to the canvas or plaster on which the work is to be executed, either by tracing with a hard point or by pricking with pins (a process called "pouncing"), charcoal in both cases being rubbed on the back of the drawing. In fresco (q.v.) painting, the plaster on which the work is executed must be kept wet, in order that it may absorb the color, and subsequently only a small portion can be executed at a time. For this reason the cartoon must be traced in small compartments of the size that the artist can finish without stopping. It is here, consequently, above all, that the necessity for the previous execution of a cartoon is greatest, as it would be impossible to sketch the whole design on the plaster in the first instance. In weaving superior tapestries, like the Gobelins, it is the present practice to cut out all the figures represented, which are always in color, and place them behind or under the wool. The great masters of the Renaissance used such studies in *chiaroscuro* as guides to them in almost all their decorative works, and many of these monuments of their care, as well as of their genius, have been preserved. They are quite as interesting and often rise to the dignity of the fresco and oil work. The most celebrated surviving examples of the fifteenth century are Andrea Mantegna's nine cartoons of the "Triumph of Julius Caesar," long used as hangings in the ducal palace at Mantua, but now at Hampton Court. They are probably the artist's greatest achievement and represent more adequately the antique feeling of the Renaissance than any work of the century. Epoch making in Italian painting were the cartoons of incidents from the war with Pisa, painted in rivalry for frescoes in the Palazzo Vecchio, Florence, by Michelangelo and Leonardo da Vinci. In neither case was the fresco completed, and the cartoons have been destroyed; but so great was their influence upon the younger artists, especially in the case of Michelangelo's, that they may be said to have revolutionized Florentine painting. The central feature of Michelangelo's cartoon was a group of bathing soldiers surprised by the enemy; of Leonardo's, a fierce battle over a standard. Less important in the history of painting, but equally well known by reason of their survival, are the cartoons which Raphael designed, at the command of Leo X, for the 12 tapestries of the Sistine Chapel. Of the originals, depicting scenes from the lives of Christ and the Apostles, seven survive in the South Kensington Museum; they were purchased by Rubens for Charles I, saved by Cromwell, who commanded that they should be purchased for the nation, and preserved from neglect by William III. Among the best subjects are "Paul Preaching at Athens,"

"Christ Delivering the Keys to Peter," and "The Miraculous Draught of Fishes." In conception and design they belong to the very best work Raphael ever created. Of the tapestries woven in Flanders after these designs, one set is in the Vatican and part of another in the Berlin Museum. Others of Raphael's cartoons, for the most part in repainted condition, survive; of especial interest is the beautiful design for the "School of Athens" in the Ambrosiana, Milan. There are four good examples by Giulio Romano in the Louvre, and cartoons by Italian painters of the seventeenth century, notably the Carracci and Domenichino, also survive. Owing to the disuse of fresco painting at the present day, cartoons are but seldom produced. At the beginning of the nineteenth century, however, the school of Munich, founded by Peter von Cornelius, made such frequent use of this medium that their manner is called the "Cartoon Style." They almost confined themselves to this work, leaving the execution of the frescoes to their pupils, much to the detriment of the color. Besides Cornelius, whose best cartoons, notably the "Apocalyptic Riders," hang in the Berlin Museum, the greatest cartoon painter of the school was Kaulbach. Consult the biographies of the artists mentioned above. The name "cartoon" is also applied to large sketches in journals and other publications, mostly of a comic nature. See CARICATURE.

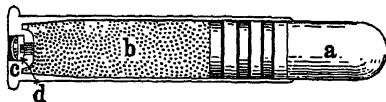
CARTOUCHE, kâr'toosh' (Fr. *cartouche*, It. *cartoccio*, from Lat. *carta*, paper). A military term for the cartridge pouch or box carried by soldiers of the French army. Also a paper case for holding a charge of powder for a firearm; a cartridge. The ammunition pouch of the British soldier was formerly known as a cartouche. The name originally described a wooden case containing from 200 to 300 musket bullets, and 8 or 10 one-pound balls, fired from a mortar or howitzer in the defense of a ditch or intrenchment.

CARTOUCHE, kâr'toosh'. A term used by the French for certain oval ornaments, scrolls, or shields employed in art and architecture. The word is perhaps best known as the technical term for the oval frame with a sort of handle which inclosed the names of Egyptian kings in hieroglyphic inscriptions. Originally it was the hieroglyph for the word *ram*, 'name.' The term is sometimes applied to modillions or brackets supporting a cornice.

CARTOUCHE, kâr'toosh', LOUIS DOMINIQUE (1693-1721). The leader of a band of robbers and assassins, whose crimes created terror in Paris. For many years he eluded the police,

CAR-TRANSFER BOAT. See FERRY.

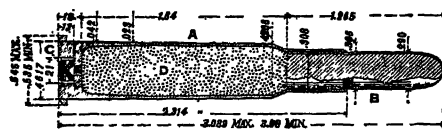
CARTRIDGE (corrupted from *cartouche*). The whole or a portion of the charge for a firearm put up in a bag or case. A cartridge for small arms consists of a brass cartridge case filled with powder and fitted with a primer and having its open end closed by the bullet, which is firmly crimped in place.



BALL CARTRIDGE FOR .45 CALIBRE SPRINGFIELD RIFLE (U. S.).

a, lead bullet; b, charge of black powder (later, smokeless); c, solid-head case; d, primer.

The first cartridges were designed for muzzle-loading small arms, where projectile and charge were tied together and inserted in one bundle. For many years prior to the Civil War small arms were furnished with cartridges containing ball and charge in paper which was torn and the powder poured into the bore, followed by the ball. Similar cartridges were used with the first breechloaders, but the escape of gas out of the breech and into the mechanism gave trouble, and metallic cartridge cases which served also to check the escape of gas had to be adopted. They were first of copper, with folded head, in the rim of which was the priming



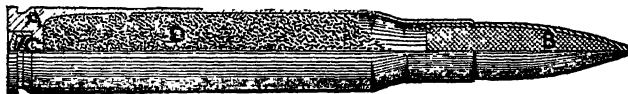
(Dimensions in inches.)

BALL CARTRIDGE FOR .30 CALIBRE U. S. MAGAZINE RIFLE.

A, solid-head case; B, bullet of lead with steel jacket; C, primer; D, charge (smokeless powder).

composition (rim-fire). In addition to danger of accidental discharge, the cases were weak where folded and sometimes burst. A folded-head case, with a cup to keep gas out of the fold, was then introduced; and at the same time the composition was put opposite the centre of the head, resting on the cup, which formed an anvil on which it could be exploded (cup anvil). This was followed by a brass case with solid head, made in one piece by drawing. The primer was outside the case in a small cap.

Machine guns were made possible by metallic small-arms ammunition, and they in turn devel-



BALL CARTRIDGE MODEL OF 1906 FOR .30 CALIBRE U. S. MAGAZINE RIFLE.

A, solid-head brass case; B, bullet of lead and tin composition inclosed in a jacket of cupro nickel; C, primer; D, charge (smokeless powder). Muzzle velocity, 2700 feet per second.

but at last was arrested, and after a long trial, which aroused a great deal of interest, was sentenced to death and broken on the wheel at Châtelet. His life afforded the basis for numerous plays. Consult Maurice, *Cartouche, histoire authentique* (Paris, 1859).

oped it. Increasing in calibre and developing into the rapid-fire gun, they naturally continued to use metallic-case fixed ammunition. Difficulties of manufacture of the larger cases have been overcome, cases as large as desired being now drawn from one piece in dies, as are small-arms

cases, while formerly the larger sizes had to be built up of drawn tubing riveted to the head. In the United States land and naval service, and as a general rule abroad, guns of 4.7-inch calibre and less have cartridges of this sort. Six-inch guns have a metallic case for the powder charge, but on account of weight the projectile is inserted separately. Larger guns have the powder charge put up in bags, the projectile being separately loaded. Eight-inch guns have the powder charge put up in two sections; 10- and 12-inch in four, for convenience in handling. See **AMMUNITION**.

A *blank cartridge* is one which does not contain a projectile. It is used for salutes, for practice, and for signals.

A *dummy cartridge* contains no powder. It is used for drill purposes only. By practicing with dummies instead of loaded cartridges the danger of handling the latter is avoided without much loss of efficiency in the drill, if the dummies are properly designed.

A *guard cartridge* is like the *ball cartridge* above described, except that the muzzle velocity is 1200 instead of 2700 feet per second. This cartridge is used by sentinels guarding prisoners at military posts.

CARTRIDGE PAPER. A strong paper, originally manufactured for soldiers' cartridges, and also used by artists, its rough surface being useful for certain kinds of drawing; the name is also given to a class of wall papers of similar texture.

CARTWRIGHT, EDMUND (1743-1823). An English clergyman, inventor of the power loom. He was born, April 24, 1743, at Marnham, Nottinghamshire, England. Educated at Oxford, he obtained a living in the English church, and devoted himself to his ministerial duties and to literature until a casual conversation in 1784 directed his attention to machinery, and in 1785 he exhibited his first power loom (see **LOOM**), in an ingenious though very rude machine, upon which, however, he subsequently effected improvements. In the following year he invented self-acting temples or devices to keep the cloth stretched across the loom against the transverse pull of the filling. Its introduction was vehemently opposed, and a mill fitted up with 400 of his looms was ignorantly and maliciously burned down. Cartwright in 1789 took out a patent for a wool-carding machine and secured patents for various other improvements in manufacturing and other machinery. In 1797 he patented a steam engine in which alcohol was the fuel employed. He also assisted Robert Fulton in his steamboat experiments. But his patents yielded him little return, and in 1809 the British government, in consideration of his inventions, granted him £10,000. He died October, 1823. His daughter published a *Life* (London, 1843).

CARTWRIGHT, JOHN (1740-1824). An English politician and pamphleteer, popularly known as Major Cartwright, and surnamed "The Father of Reform." He was a brother of Edmund Cartwright the inventor, and born at Marnham, Nottinghamshire, Sept. 17, 1740. He entered the navy at 18; in 1758 was present at the capture of Cherbourg, and the following year fought in the action between Hawke and Confians. Afterward he went to the Newfoundland station, and for five years ably discharged the duties of chief magistrate, to which he was appointed. At the outbreak of the American Revolution he espoused the cause of the Colonies;

declined to fight against them, resigned, and in 1774 published *American Independence the Glory and Interest of Great Britain*. He received an appointment as major in the Nottingham militia, but after 17 years of service, partly on account of his sympathy with the Revolution in France, was superseded. With honesty of purpose, by voice and pen he worked for manhood suffrage, the ballot, annual parliaments, the improvement of national defenses, the liberties of Spain and Greece, and other popular causes. In 1813 he was arrested for plain speaking, but soon released, and in 1820 was indicted for sedition and fined £100. He died Sept. 23, 1824. In 1831 a monument by Macdowell was erected to his memory in Burton Crescent, London. His writings are comprised in a list of 80 books and tracts given in *The Life and Correspondence of Major Cartwright*, ed. by his niece, F. D. Cartwright (2 vols., London, 1826).

CARTWRIGHT, PETER (1785-1872). An American clergyman. He was born in Virginia, but in early life settled in Kentucky, where, in 1806, he became a circuit rider in the Methodist Episcopal church, and in 1808 a presiding elder, preaching everywhere throughout Kentucky and Tennessee. In 1824 he removed to Illinois, where he continued his work. He was also a member of the Illinois Legislature, and an opponent of Abraham Lincoln in an election for Congressman in 1846. In the course of 33 years he preached as many as 15,000 sermons and baptized 12,000 converts. He was widely known for his homely but powerful preaching, and interesting stories are told of his daring and romantic adventures among the rough backwoodsmen. Many of these can be found in his *Fifty Years a Presiding Elder* (1871) and in the *Autobiography of Peter Cartwright* (New York, 1856). He published several pamphlets, of which the best known is *Controversy with the Devil* (1853). Consult also Stevens, *Observations on Dr. Cartwright and The Backwoods Preacher* (London, 1869).

CARTWRIGHT, SIR RICHARD JOHN (1835-1912). A Canadian statesman. He was born at Kingston, Ontario, and was educated at Trinity College, Dublin. On his return to Canada he studied law, but, having decided to enter politics, he relinquished his legal studies without being called to the bar. In 1863 he was elected a Conservative member of the Legislative Assembly, and after the federal union of the provinces in 1867 was elected to the House of Commons. He remained a Conservative during the greater part of the first administration of Sir John Alexander Macdonald (q.v.), but withdrew his support of that statesman by reason of disclosures connected with what was commonly known as the Pacific [Railway] Scandal, and in 1873 joined the Liberal party. In the same year he was appointed Minister of Finance in the cabinet of Alexander Mackenzie (q.v.), but upon the defeat of the Liberals in 1878 he went into opposition and until 1896 was chief critic of the Conservative fiscal and trade policy. He was a strong opponent of protection, and his many public speeches against it were remarkable for clear exposition and caustic wit. During the long period of opposition the Liberal tariff policy underwent various changes, the most notable being a declaration for commercial union with the United States, of which Cartwright was the most active advocate. After the general election of 1891, which went against the Liberals, and which was

contested on the question of reciprocity with the United States, the prestige of the Conservative administration began to weaken by reason of new leaders and divided counsels; the Opposition adopted new means of attack, and in 1896 Wilfrid Laurier (q.v.) became Premier. In the Laurier cabinet Cartwright was given the portfolio of Trade and Commerce, a new ministerial department. As he had remained a staunch free trader, favoring a tariff only for revenue, while the policy of his colleagues was that of moderate protection, his influence in shaping fiscal legislation was somewhat less than before; nevertheless his parliamentary experience and his mastery of economic and financial questions, together with his great strength and readiness in debate, made him, next to Laurier, the most prominent man in his party.

In 1897 he was a delegate to Washington in behalf of improved commercial relations with the United States, and in 1898-99 he was a member of the Anglo-American Joint High Commission for the settlement of outstanding matters of dispute between Britain and the United States. (See CANADA, *History*.) He was appointed a member of the Senate in 1904, and four years later secured the passage of a law in favor of old-age annuities—a measure which, in return for small stated payments resumable at any time after lapse, guaranteed to persons 55 years old or more an annuity free from forfeiture and exempt from seizure. Cartwright became government leader in the Senate in 1909. On several occasions, during Laurier's absence abroad, he was acting Premier. During the latter part of his career his influence in the Liberal party remained unabated. In 1879 he received the honor of knighthood and in 1902 was made a member of the Imperial Privy Council. He twice declined the office of Lieutenant Governor of Ontario. In his later years he held a strong conviction that Canada, by reason of its position and sympathetic knowledge of conditions both in the United States and Britain, was especially fitted to be the medium of an alliance between all English-speaking peoples. In 1912 he published his *Reminiscences*, a valuable retrospect and study of the events and of the public men with whom he came in contact in his political career down to the year 1896.

CARTWRIGHT, THOMAS (c.1535-1603). A Puritan leader of the time of Elizabeth. He was born in Hertfordshire and studied divinity at Cambridge, being entered as sizar at Clare Hall in 1547 and elected to a scholarship at St. John's College in 1550. Here he soon became an active defender of the new religious doctrines which were then in the ascendancy at Cambridge and of which St. John's was the stronghold. During Mary's reign he was forced to discontinue his studies at the university and became clerk to a counselor at law. Returning to Cambridge after the accession of Elizabeth, he came under the influence of the Puritan theologian Dr. James Pilkington, then master of St. John's, from which college he received a fellowship in 1560. Two years later the major fellowship in Trinity was conferred upon him. In 1564 he took part in a theological disputation before Queen Elizabeth, who, it is alleged, strongly favored his adversary. Five years later he became Lady Margaret professor of divinity; but in 1570 he was deprived of his professorship by Whitgift, then vice chancellor, who was offended by Cartwright's attacks on the

hierarchy and government of the Established church. The next year he lost his fellowship in Trinity by command of the same officer, and then made a visit to Geneva, where he met Theodore Beza, who greatly admired his learning. He returned to England in 1572 during the excitement caused by the publication of the famous *Admonition to the Parliament*, written by two London clergymen, John Field and Thomas Wilcox. This book gave definiteness to the Puritan movement, presenting the Calvinistic system of Geneva as a model for reforms of the English church. Cartwright gave aid and comfort to the authors, who were imprisoned, and defended the book in a second *Admonition to the Parliament*. To this Whitgift produced an *Answer*, which was followed by another paper by Cartwright, attacking the forms and ceremonies of the church, such as the use of the ring in the marriage celebration and the cross in baptism. An indirect result of the controversy was the production of one of the most remarkable books of that fruitful age, Hooker's *Ecclesiastical Polity* (consult introduction to edition by Hanbury, London, 1830). In 1573 the Court of High Commission issued an order for Cartwright's arrest. Accordingly he fled to the Continent, where for a time he preached before the English congregations in Antwerp and Middelburg. Returning without the Queen's consent in 1585, he was imprisoned in the Fleet without legal warrant by the bigoted Aylmer, Bishop of London; but he was presently set free. He was committed to the Fleet in 1590, and again in 1591, when he refused to take the infamous oath *ex officio*. From his liberation in 1592 until his death in 1603, he appears to have escaped persecution; but, as sometimes alleged, there is no evidence that he changed his views.

Consult: Isaac Maddox, *Vindication of the Government, Doctrine, and Worship of the Church of England Against Neal* (London, 1733); Hallam, *Constitutional History of England*, vol. i (new ed., London, 1876); Dexter, *Congregationalism* (New York, 1880); Mullinger, *History of the University of Cambridge*, vol. ii (London, 1873-84); id., in *Dictionary of National Biography*, vol. ix (New York, 1887); Cooper, *Athenæ Cantab.*, vol. ii (Cambridge, 1858-61); Strype, *Annals* (new ed., Oxford, 1824); id., *Life of Whitgift* (Oxford, 1822); and for the controversy over the *Admonition*, Whitgift, *Defense of the Answer*, in his *Works* (Cambridge, 1851-53), published by the Parker Society.

CARTWRIGHT, WILLIAM (1611-43). An English poet and divine, born at Northway, near Tewkesbury. He graduated M.A. at Christ Church, Oxford (1635), took orders, became precentor of Salisbury Cathedral, and junior proctor of Oxford (1643), and died a few months later (November 29). Cartwright was much beloved by many friends, among whom was King Charles I. He is a good example of a once large class of "florid and seraphical preachers." He wrote several plays, of which the *Ordinary*, ridiculing the Puritans, has considerable interest. His *Comedies, Tragi-Comedies, with Other Poems* were collected by Moseley (London, 1651). Consult: Ward, *English Poets*, vol. ii (London, 1881); Bullen, "William Cartwright," in *Dictionary of National Biography*, vol. ix (1887), an excellent article; Ward, *History of English Dramatic Literature* (1899).

CARUCATE, kār'û-kât (ML. *caruocata*, from

caruca, plow. Lat. *carruca*, carriage, from *carus*, car), or PLOWLAND. In the mediæval manor, the land which could be tilled in a year by one plow with its eight oxen. The carucate was used as a unit of measure, but varied in different localities from 120 to 180 acres. See HIDE.

CARUCCI, JACOPO. See PONTORMO.

CARÚPANO, ká-rûp'pá-nô. A seaport of the State of Bermúdez, Venezuela, situated on the north side of the peninsula of Paria (Map: Venezuela, E 1). The town manufactures straw hats, ropes, soap, brandy, sugar, and earthenware, and is besides an export centre for cotton, dyewoods, cacao, and coffee. It is the residence of a United States consular agent. Pop. (1908 est.), 8000.

CARUS, ká'rus, JULIUS VICTOR (1823-1903). A German zoölogist, born in Leipzig, Aug. 25, 1823. He was custodian of the Museum of Comparative Anatomy at Oxford from 1849 to 1851. In 1853 he became professor of comparative anatomy at Leipzig, where subsequently he was made professor extraordinarius of zoölogy. His more important works are: *Zur nähern Kenntniss des Generationswechsels* (1849); *System der tierischen Morphologie* (1853); *Icones Zootomicæ* (1857). He also translated Darwin's works into German, and in 1878 became editor of the *Zoologischen Anzeiger*.

CARUS, KARL GUSTAV (1789-1869). A German physician and physiologist, born in Leipzig. He studied medicine at the university of his native city and began in 1811 to give lectures on comparative anatomy. During the War of 1813 he was at the head of the military hospital at Pfaffendorf, near Leipzig, and in 1814 he was made professor of obstetrics at the Academy of Medicine and Surgery in Dresden. He was made royal physician in 1827 and called to the Privy Council in 1862. Following are the most important of his works: *Lehrbuch der Gynäkologie* (2 vols., 1820); *Erläuterungstafeln zur vergleichenden Anatomie* (1826-55); *Grundzüge der vergleichenden Anatomie und Physiologie* (3 vols., 1828); *System der Physiologie* (2d ed., 1847-49); *Erfahrungsergebnisse aus ärztlichen Studien und ärztlichem Wirken* (1859); *Ueber Lebensmagnetismus* (1857); *Lebenserinnerungen und Denkwürdigkeiten* (4 vols., 1865-66); *Natur und Idee* (1861); *Atlas der Kranioskopie* (1864); *Vergleichende Psychologie* (1866).

CARUS, MARCUS AURELIUS (?-283). Emperor of Rome 282 to 283. Of Illyrian origin, he had held many civil and military positions when the Emperor Probus made him pretorian prefect in 282; soon after, at the assassination of Probus, he was chosen Emperor by the legions. He was successful in campaigns against the Sarmatians and the Parthians, but died near Ctesiphon in August, 283.

CARUS, PAUL (1852-1919). A German-American editor, born at Ilseburg, Germany, and educated at the universities of Strassburg and Tübingen. Afterward he came to this country and established himself in Chicago, where he became editor of the *Open Court* and the *Monist*. Under his direction the Open Court Publishing Company has done fine service in putting before the public valuable works on philosophy and religion. His publications include: *The Soul of Man* (1891); *Monism: Its Scope and Import* (1891); *Religion and Science* (1893); *The History of the Devil* (1900); *The*

Surd of Metaphysics (1903); *The Story of Samson* (1907); *Foundations of Mathematics* (1908); *God* (1908); *Pleroma* (1909); *The Philosophy of Form* (1911); *The Mechanistic Principle and the Non-Mechanical* (1913); *The Principle of Relativity in the Light of the Philosophy of Modern Science* (1913); *Nietzsche and Other Exponents of Individualism* (1914), in addition to several works on Buddhism and Chinese philosophy.

CARUSO, ká-rûs'zô, ENRICO (1873-1921). An Italian dramatic tenor. He was born in Naples, Feb. 25, 1873, and was a pupil of Lamperti and Concone. He attracted general attention in 1896 in *Traviata* at the Teatro del Fondo (Naples). Engagements followed at St. Petersburg, Buenos Aires (summers of 1899-1903), Monte Carlo, London (1903), Rome, Lisbon, and New York (1904). His repertoire includes more than 40 operas (chiefly Italian). He created rôles in Giordano's *Fedora*; Mascagni's *Le Maschere*; Franchetti's *Germania*; Puccini's *Bohème*, *Madame Butterfly*, and *The Girl of the Golden West*. From his first appearance in 1904 he became the chief attraction of the Metropolitan Opera House Company in New York, his voice being one of extraordinary beauty and power, though lacking in the highest artistic refinement, while his acting did not rise above the conventional. In 1913 he sang in three performances in Vienna, for each of which he received 15,000 crowns (about \$5000). Consult J. H. Wagenmann, *Enrico Caruso und das Problem der Stimmbildung* (Altenburg, 1911).

CARUTHERSVILLE, ká-rûth'êrz-vîl. A city and the county seat of Pemiscot Co., Mo., 220 miles south by east of St. Louis, on the St. Louis and San Francisco Railroad, and on the Mississippi River (Map: Missouri, G 5). Caruthersville contains a hospital and a therapeutic institute. It is in a lumbering and cotton-growing section and has a cottonseed-oil mill, stave, heading, and hoop factories, cotton gins, grain elevator, egg-case factory, saw and planing mills, machine shop, bottling works, and harness and ice-cream factories. Caruthersville was settled in 1778 and was incorporated in 1894. Pop., 1900, 2513; 1910, 3655.

CARVAJAL, FRANCISCO DE. See CARBAJAL, FRANCISCO DE.

CARVAJAL, kár'vá-hál', GASPAS DE (c.1500-84). A Spanish missionary, born in Estremadura. He became a member of the Dominican brotherhood, and went as a missionary to Peru in 1533. When Gonzalo Pizarro organized his expedition to eastern Peru in 1540, Carvajal was selected as his chaplain. Afterward he became subprior of the convent of San Rosario, Lima, but later devoted himself to the conversion of the Indians in Tucuman. He greatly encouraged missionary labor and the development of colonization. He became provincial of his order in Peru in 1557, was named deputy to represent the religious province of Peru at Rome in 1565, but did not leave the country. He wrote *Descubrimiento del Río de las Amazonas*, unedited until 1894.

CARVAJAL, or CARBAJAL, TOMÁS JOSÉ GONZÁLEZ. See GONZÁLEZ CARVAJAL, TOMÁS JOSÉ.

CARVALHO, kár-vá'lyô, JOSÉ DA SILVA (1782-1845). A Portuguese statesman, born in Castelbranco (Beira). Having studied law in the University of Coimbra, he became a judge in 1810. From 1817 he was busily devising

methods for the accomplishment of national freedom. He took a prominent part in the revolution of 1820 and became a member of the provisional government. On the accession of John VI he was appointed Vice President of Lisbon, and was granted the portfolio of Justice, which he retained until the revolt of 1823 forced him into exile. On the death of John VI and the accession of Dom Pedro, he returned to Portugal, in 1826; but was again exiled, in 1828, by Dom Miguel, the Usurper. Later, Carvalho organized in England an expedition against Dom Miguel and succeeded in driving out the Usurper. Thereupon Dom Pedro confided to him the portfolio of Finance, which he held 1832-36. In this latter year, on the occasion of the revolutionary reaction in favor of the constitution of 1820, he was compelled to go into exile, but in 1842 returned, assisted in the reestablishment of the constitution of Dom Pedro, and was appointed a Councillor of State.

CARVALHO, kār-vā'lyō, MARIE CAROLINE FÉLIX MIOLAN (1827-95). A French singer, born at Marseilles. She entered the Conservatory of Music in Paris and took the first prize, 1847. Her début was made at the Opéra Comique, where her voice, though small, had all the wonderful phrasing that afterward made her one of the greatest singers of her time. In 1856 she married M. Carvalho, who took the direction of the Théâtre Lyrique. In 1885 she left the stage.

CARVALHO E MELLO, SEBASTIÃO JOSÉ DE. See POMBAL, MARQUIS OF.

CARVEL-BUILT. See BOAT.

CARVER, JOHN (c.1575-1621). A leader of the Pilgrim Fathers and the first Governor of Plymouth Colony. He was born in England, probably in Nottinghamshire, but with others removed to Holland in 1607 or 1608, on account of religious persecution, and in 1617 was sent by his companions, with Robert Cushman, to make arrangements with the Virginia Company for the establishment of a colony in America. A patent was finally secured by Bradford and Cushman in 1619, and with 100 other colonists Carver set sail from Plymouth on Sept. 6, 1620. When the famous Compact of Government was drawn up, Carver was made Governor, and during the hardships and privations of the next few months did much to encourage his associates and to promote the success of the Colony. On March 23, 1621, he was elected Governor of Plymouth for a second term, but died of a sunstroke in the following month.

CARVER, JONATHAN (1732-80). An American traveler. He was born in Stillwater, N. Y. After serving in the Colonial army, he began a voyage of exploration. According to his story he started from Boston in June, 1766, proceeded to Michilimackinac, 1300 miles away, arranged with the Governor there to furnish him at an early date with needed supplies at the Falls of St. Anthony, and then passed westward along the Fox and Wisconsin rivers to the Mississippi; but, the promised supplies not having been sent, he spent some time with the "Naudowessies of the Plains" (Sioux), explored much of the territory in the present State of Minnesota, and in October, 1768, again reached Boston. He went to England in 1769 to publish his journal, but failed to secure the expected assistance, and, having spent his whole fortune in furthering his explorations, was forced to earn a livelihood as a hack writer. In 1788 a book appeared under the title *Three Years' Travels Throughout the*

Interior Parts of North America, purporting to be of his authorship. It had a wide sale. Early critics suspected that it was not an original work, but the high regard in which it was universally held for many years is attested by Tyler's estimate in *The Literary History of the American Revolution* (New York, 1897). It is mainly a compilation from Charlevoix, Hennepin, Lahontan, and others, and contains inaccuracies of which a real traveler would not have been guilty. Carver furthermore was probably too ignorant a man to have written it, and even the claimed extensiveness of his travels is discredited. Carver wrote a pamphlet, *A Treatise on the Culture of the Tobacco Plant Adapted to Northern Climates* (1799), and published under his name a crude compilation entitled *The New Universal Traveler*. Consult *The Carver Centenary* (1867), published by the Minnesota Historical Society; and as to the spuriousness of the "Travels," consult E. G. Bourne in the *American Historical Review* (January, 1906).

CARVER, THOMAS NIXON (1865-). An American economist, born at Kirkville, Iowa. He was educated at Iowa Wesleyan University, the University of Southern California, Johns Hopkins, and Cornell. From 1894 to 1900 he was professor of economics at Oberlin College. In the latter year he became assistant professor of political economy at Harvard University, and in 1902 he was made full professor. When the Rural Organization Service of the Department of Agriculture was established in 1913 to investigate the marketing and distribution of farm products, Carver was appointed to take charge of the work. Besides his special articles in economic reviews, he is author of *The Theory of Wages Adjusted to Recent Theories of Value* (1894); *The Distribution of Wealth* (1904); *Sociology and Social Progress* (1905); *Principles of Rural Economics* (1911); *The Religion Worth Having* (1911, 1912).

CARVING (OE. *kervingē*, from *kerven*, to carve, AS. *ceorfan*, Icel. *kyrfa*, Ger. *kerben*, ultimately connected with Gk. *γράφειν*, *graphein*, to write, originally to cut). A subordinate branch of sculpture, usually performed on ivory or wood. The term is applied to sculpture of a decorative character, as distinguished from statuary or monumental relief. The use of carving by ancient, mediæval, and modern nations is described at some length in the articles in its two principal branches, viz., **IVORY CARVING** and **WOOD CARVING**.

CARY, ALICE (1820-71) and PHOEBE (1824-71). Two American poets, born near Cincinnati, Ohio. They gained their first success by *Poems of Alice and Phæbe Cary* (1850). In 1851 Alice issued *The Clovernook Papers* (2d series, 1853), and *Clovernook Children* (1854), tales of Western life. In 1850 the sisters moved to New York, where Alice published: *Lyra and Other Poems* (1852; enlarged 1855); *Lyrics and Other Hymns* (1866); *The Lover's Diary* (1867); *Snow Berries*, a book for young folks (1869); *Hagar: A Story of To-Day* (1852); *Married, Not Mated* (1856); *Pictures of Country Life* (1857); *The Bishop's Son* (1857); and *The Adopted Daughter* (1859). All these are excellent in domestic description. Phoebe published: *Poems and Parodies* (1854); *Poems of Faith, Hope, and Love* (1868); with numerous hymns (chiefly in *Hymns for All Christians*, edited by C. F. Deems, 1869), and occasional pieces. Her best-known hymn is

"Nearer Home." Under the friendship and patronage of Horace Greeley the sisters achieved literary and social success in New York and maintained it for nearly two decades. They died within three months of each other. A collected edition of their poems appeared posthumously. Consult Mary C. Ames, *Memorial of Alice and Phoebe Cary* (New York, 1873), and Trent, *A History of American Literature* (New York, 1903).

CARY, ANNIE LOUISE (1841-1921). An American contralto, born in Wayne, Me. After having studied in Milan with Giovanni Corsi (1866-68), she appeared in Italian opera in Copenhagen. Afterward she received instruction from Viardot-Garcia in Baden-Baden and sang with great success in Stockholm, Paris, Brussels, and London. She made her début in New York in 1870, singing with Nilsson, Brignoli, and Vieuxtemps. Her success with the public was instantaneous, and for a dozen years she was the favorite singer in the United States. She created, in New York, the part of Amneris in *Aida* (1873). Her tours in Russia in 1875-77 were a series of continuous triumphs. In 1882 she married Charles M. Raymond, of Brooklyn, and retired from public life, only occasionally singing for charity.

CARY, ARCHIBALD (c.1730-86). An American patriot, born in Virginia. He was a member for several years of the House of Burgesses, where he was conspicuous as an opponent of the arbitrary measures of the British ministry. He was a member of the Committee of Correspondence in 1773, and in 1776, as a delegate to the famous Virginia Convention, introduced the resolutions by which the Virginia delegates in the Continental Congress were instructed to propose a declaration of independence. He was president of the Virginia Senate from the organization of the State government until his death.

CARY, ELISABETH LUTHER (1867-). An American author, born in Brooklyn, N. Y. She was educated privately and for ten years studied art. Until 1908 she was editor and owner of the *Scrip.* and thereafter was editor of the art department of the *New York Times*. She translated many books from the French and wrote: *Alfred Tennyson: His Homes, his Friends, and his Work* (1898); *Robert Browning, Poet and Man* (1899); *The Rossettis, Dante Gabriel and Christina* (1900); *William Morris* (1902); *Ralph Waldo Emerson, Poet and Thinker* (1904); *Artists, Past and Present* (1908).

CARY, GEORGE LOVELL (1830-1910). An American theologian, born at Medway, Mass. He was educated at Harvard and at Allegheny College, was professor at Antioch College, Ohio, from 1872 to 1862 and professor of New Testament literature at Meadville Theological School from 1862 to 1902. His works include: *Introduction to the Greek of the New Testament* (1879; 2d ed., 1881); *The Synoptic Gospels, with a Chapter on the Text-Criticism of the New Testament* (1900); and the volume on "Matthew, Mark, and Luke," in the *International Handbooks to the New Testament* (1900).

CARY, HENRY FRANCIS (1772-1844). An English writer and clergyman, known for his admirable translation of Dante. He was born at Gibraltar, studied at Christ Church, Oxford, and became a clergyman of the Church of England. From 1826 to 1837 he was assistant keeper of printed books in the British Museum.

In 1805 he translated Dante's *Inferno*, and in 1814 the whole of the *Divina Commedia*, his translation being remarkable not only for its accuracy, but for its expressiveness and force. He afterward translated Pindar's *Odes* and Aristophanes' *Birds* and wrote a series of memoirs, in continuation of Dr. Johnson's *Lives of the Poets*. He was an intimate friend of Coleridge and Charles Lamb. Consult the *Memoir* by his son, Henry Cary (London, 1847).

CARY, LUCIUS. See FALKLAND, second VISCOUNT.

CARYA. See HICKORY.

CARYATIDES, kār'i-āt'i-déz (Lat., Gk. *Karyárides*, *Karyatides*, women of Caryæ). A name given in Greek architecture to female figures, when used instead of columns to support a roof. Vitruvius states that, since the inhabitants of Caryæ, a city in Laconia, had joined the Persians, the Greeks destroyed the town, slew the men, and carried the women into captivity. As a token of triumph, they introduced figures of the women and of the conquered Persians as supports in architecture. This story is pure invention. Such figures are found in Egypt and Greece from early times as supports of thrones or lustral vases. They were used also as columns for the treasuries of the Cnidians and the Siphnians at Delphi (sixth century B.C.). The female figures are always calm and dignified, in no way oppressed by the weight they sustain. The name properly denotes only a supporting figure, in which one hand is raised to help sustain the weight; others were called *Canephoroi*. The most celebrated Caryatides are the figures which support the southwest porch of the Erechtheum (q.v.) in Athens, called the "Porch of the Maidens." Male figures used for the same purpose, called *Atlantes*, clearly betray suffering under a heavy burden. Consult Homolle, in *Bulletin de Correspondance hellénique*, vols. xxiii, xxiv (Paris, 1899). The Greek word *caryatis* means not only a woman of Caryæ, but also a dancer in the peculiar dance with which the Laconian maidens honored Artemis Caryatis.

CARYL, JACOB (1602-73). An English Nonconformist clergyman during the revolutionary period. He was educated at Oxford, became preacher at Lincoln's Inn, and in 1643 was appointed a member of the Westminster Assembly of Divines. He was a moderate Independent, but zealous for the Covenant. By order of Cromwell he attended Charles I in Holmby House, and in 1650 he was sent with Dr. John Owen to accompany Cromwell to Scotland. His chief published work was a ponderous commentary on the Book of Job (12 vols.), in which, after the fashion of his time, he enlarged on every verse and almost on every word.

CARYOCAR (Neo-Lat., from Gk. *kárvon*, *karyon*, nut + *kápa*, *kara*, head). A genus of a dozen species of large trees of the family Ternstroemiaceæ. They are all natives of Guiana and Brazil and are sometimes called *pekea* trees. They yield good timber for shipbuilding and produce the delicious nuts occasionally met with in markets, called *butternuts*, or *souari nuts*. The fruit is a sort of drupe, containing several nuts. The fleshy part of the drupe consists of a butter-like substance, which melts between the fingers, and is used in cookery instead of butter, on which account these trees are sometimes called *butter trees*. It forms merely a thin covering for the nuts. The kernels are

remarkably soft. An oil is extracted from them which is scarcely inferior to olive oil. *Caryocar nuciferum* is now cultivated in the island of St. Vincent; *Caryocar butyrosum*, *Caryocar glabrum*, *Caryocar tomentosum*, and other species appear equally worthy of attention.

CARYOPHYLLACEÆ, kār'ī-ō-fil-lā'sé-ē (Neo-Lat. nom. pl., from *Caryophyllus*, from Gk. κάρυον, *karyon*, nut + φύλλον, *phyllon*, leaf). A family of dicotyledonous plants, containing about 50 genera and 1100 species, mostly herbaceous plants, a few half shrubby. The stems are often tumid at the joints; the leaves always opposite and entire, often uniting around the stem. The flowers are regular; the calyx persistent, of 4 or 5 sepals, either free or united into a tube; the corolla of 4 or 5 petals, which are frequently bifid, and generally terminate in a claw at the base, sometimes wanting; the stamens are many, or twice as many, as the petals; the ovary of 2 to 5 carpels; the styles are stigmatic along the inside; the fruit is a one-celled capsule, with central placenta, to which the seeds are attached. The plants of this family are mostly natives of temperate and cold countries; some of them are found only on mountains, near the limits of perpetual snow. Some of them are inconspicuous weeds, some showy flowers; almost all are insipid and inert; a few contain saponine and afford a substitute for soap. (See SOAP-WOOL.) To this order belong the pink, carnation, sweet william, lychnis, and chickweed.

This family very naturally divides into two distinct groups which differ biologically and morphologically, the Silenoideæ and Alsinoideæ. In the first the flowers are gamosepalous; in the other they have distinct sepals, and the stamens are often perigynous. The chief genera of the first group are *Silene*, *Lychnis*, *Gypsophila*, and *Dianthus*, while of the second *Stellaria*, *Cerastium*, *Arenaria*, *Spergula*, *Paronychia*, and *Scleranthus* are the best known.

CARYOPYSIS (Neo-Lat., Fr. *caryopse*, from Gk. κάρυον, *karyon*, nut + ὄψις, *opsis*, appearance). The peculiar, seedlike fruit of grasses, as corn, wheat, etc., often called a "grain." The peculiarity consists in the fact that the ovary wall adheres to the inclosed seed so closely that it appears as the outermost layer of the seed. See FRUIT.

CARYOTA, kār'ī-ō'tā (Neo-Lat. nom. pl., from Gk. καρυώτης, *karyōtis*, nutlike, from κάρυον, *karyon*, nut). A genus of palms, natives of the East Indies. One species (*Caryota urens*) is remarkable for the acidity of its fruit, which produces a burning sensation when its pulp is applied to the skin. It is also highly valuable for the great quantity of juice which flows from the wounded spathes in the hot season, sometimes amounting to 100 pints in 24 hours from a single tree. Sugar (*jaggery*) is made from this juice by boiling it down, and on this account this palm is sometimes called the jaggery palm. Wine or toddy is also made by the fermentation of the juice. The trunks yield starch which is much used for food and is said to be equal to the best sago. The outer part of the stem, which is very hard, is applicable to many purposes. The fibres of the leafstalks are made into ropes, which are very strong and durable; the leafstalks, merely stripped of the leaflets, are used as fishing rods, being light, tapering, and elastic; and the woolly substance found at their base is sometimes used for calking ships. This palm is found in India and Ceylon and abounds chiefly

in mountainous districts. It rises to a height of 60 feet, with a trunk 1 foot in diameter and a magnificent spreading head of great, double-pinnate leaves and triangular leaflets, the apex of the triangle being their point of attachment. From this character of the leaflets the name fishtail palm has been given it.

CARYSFORT' REEF. A dangerous coral reef off the southeast coast of Florida, in lat. 25° 13' N., long. 80° 13' W., lying about 5 miles east of Key Largo (Map: Florida, D 4). It has a lighthouse with a flashing red and white light of the first order 100 feet above mean high water. It stands 106 feet above the sea.

CASA, kāsā (from Lat. *casa*, cottage). The prefix to many names in Italian and Spanish, signifying 'house' or 'home.'

CASA, kāsā, GIOVANNI DELLA (1503-56). An Italian prelate and poet, sometimes called the Chesterfield of Italy, from his *Galateo*, a manual of polite conduct. Of an old Florentine family, he studied in Bologna, Padua, and Rome, leading a gay and dissipated life, until he took orders in 1534. He found a friend and patron in Cardinal Alessandro Farnese, who later, as Paul III, appointed him successively apostolic envoy to Florence, Archbishop of Benevento, and Papal Nuncio to Venice. Under Paul IV he became Secretary of State and in 1555 had hopes of being made a cardinal, but lost his opportunity, as some believe, through the licentiousness of certain poems, notably his *Capitoli del forno*. As a prelate he took an active part in fighting the Italian Reformation, especially as an antagonist of Pier Paolo Vergerio. Della Casa was a prolific writer, in both Latin and Italian. The *Galateo* ranks with the *Cortegiano* of Castiglione as one of the most important books of its century. The classic elegance of its language made it one of the models for later purists. His works include a *Life of Pietro Bembo*, translations from Thucydides, and many poems distinguished for strength and polish. Translation of the *Galateo* in the *Humanists' Library* (Boston, 1914), with biography.

CASABIANCA, kāsā-byān'kā, LOUIS (1755-98). A French naval officer. He was born at Bastia, Corsica, and with the Comte de Grasse took part in the American Revolution. He was a member of the National Convention, and later one of the Council of Five Hundred, in which assembly he occupied himself with the organization of the French navy. As captain he commanded the *Orient*, the flagship of the fleet which transported Napoleon and his army to Egypt. In the battle of Abukir, when the fleet was attacked by the English, Admiral Brueys was killed, and Casabianca had command of the fleet. Even when he was wounded and the ship caught fire he remained at his post. His ten-year-old son refused to leave his father, and both were killed by the blowing up of the ship. The story forms the theme of Mrs. Hemans's famous poem.

CASABLANCA, kāsā-blān'kā. See DAB-EL-BEIDA.

CASA D'ORO, dō'rō, or **CA' D'ORO**. A palace in Venice dating from the fourteenth century, noted for its elegance. The façade, unsymmetrically divided in two vertical sections, is inlaid with marbles of various colors and pierced by arches differing in size and arrangement, which are separated in the right division by paneling and in the left by arcades.

CASA GRANDE, grān'dā (Sp., great house). A ruined structure of prehistoric origin in the

valley of the Gila River, near Florence, Arizona, on the Southern Pacific Railway. It may have been seen by white men connected with the Coronado expedition in 1540; it was certainly discovered by Padre Kino in 1694, and was revisited by him in 1697, when he held a service within it, though it had been unoccupied during the period covered by tradition. It was again visited in 1775 by Padre Font, but remained little known until rediscovered by American emigrants about 1849; it was well described by John Russell Bartlett in 1854. In 1889, on the petition of citizens chiefly resident in Massachusetts, Congress provided for the protection of the ruin as a monument of antiquity; and in 1892 the structure and the adjacent grounds, bearing less imposing ruins, were set apart as a public reservation in care of a custodian. The structure as it stood about 1895 is shown in the plate. It is of cajon or pisé construction, i.e., adobe or mud, molded in place, in walls 3 to 5 feet thick at the ground, thinning upward; the surfaces were plastered, especially within, with a slip of adobe clay. There are five rooms in the ground plan; portions of three stories remain, and there may have been a fourth in part of the structure. Recent exploration under Dr. Fewkes has shown that the main structure described above is only a small part of the ruin. Most of the other buildings are seen only in wall plan after excavation. The buildings are assembled in great walled rectangles called compounds, of which four exist at this ruin. Compound *a* contains the main structure and many clustered groups of rooms for domiciliary and ceremonial uses. The Casa Grande ruin is almost in a class by itself, but in pottery, etc., it shows very strong affiliations with the pueblo ruins, of which it may perhaps be considered a frontier example. It may have been built by the ancestors of the modern Pima who inhabit the country to-day, but it seems more likely that its builders were other people of a more distinct Pueblo type. Good descriptions are by Mindeleff (*Bureau of American Ethnology, 13th Report, 1896*), McGee (*ib.*, *15th Report, 1897*), and by Fewkes (*ib.*, *28th Report, 1912*). It is not to be confounded with the still more extensive but less-known ruin of Casas Grandes in the State of Chihuahua, Mexico.

CASA GUIDI (kã'sã gwẽ'dã) **WINDOWS.** A poem in two parts by Elizabeth Barrett Browning (1851), the passionate voicings of her intense hopes for Italian liberty.

CASAL, kã-sãl', or **CAZAL**, MANUEL AYRES DE (1754-1840). A Brazilian geographer and historian. He was born in Portugal, where he was ordained to the priesthood. Afterward he settled in the Province of Goyaz, Brazil, and traveled extensively through the country, collecting the information compiled in the valuable work entitled *Corografia brasileira, ou relação histórico-geográfica do reino do Brazil* (2 vols., Rio de Janeiro, 1817; 2d ed., 1845). This work, prepared under the auspices of King John VI, is distinguished by its exactitude and is the first circumstantial report on the interior provinces of South America. The name of the author appears on the title-page as *Um Presbytero secular do grão Priorado do Crato*. The work earned him the title of "Father of Brazilian Geography." Consult Pereira da Silva, *Plutarco Brasileiro* (1847).

CASALE MONFERRATO, kã-sã'lã môn'fẽr-rã'tõ. A fortified city of Piedmont, Italy, in

the Province of Alessandria, the ancient capital of the Duchy of Montferrat, on the right bank of the Po, 48 miles east of Turin (Map: Italy, C 2). It has a theatre, several palaces, a gymnasium, a technical institute, a seminary, and nine churches, among them the Romanesque cathedral founded in 741 by the Lombard King Liutprand. The old citadel, founded before 1500, was one of the strongest in Italy, and within recent years the fortifications have been greatly strengthened and extended. Casale is a centre of local trade, the chief industries being the culture and manufacture of silk and the making of Portland cement, machines, tools, liqueurs, and fertilizers. The town is the seat of a bishop. Pop. (commune), 1901, 31,793; 1911, 34,151.

Casale is on the site of the Roman Bodincomagus. It was founded by Liutprand in 730, and came into the possession of the marquises of Montferrat in the thirteenth century, and, after numerous changes of rulers, fell finally to the house of Savoy in 1703.

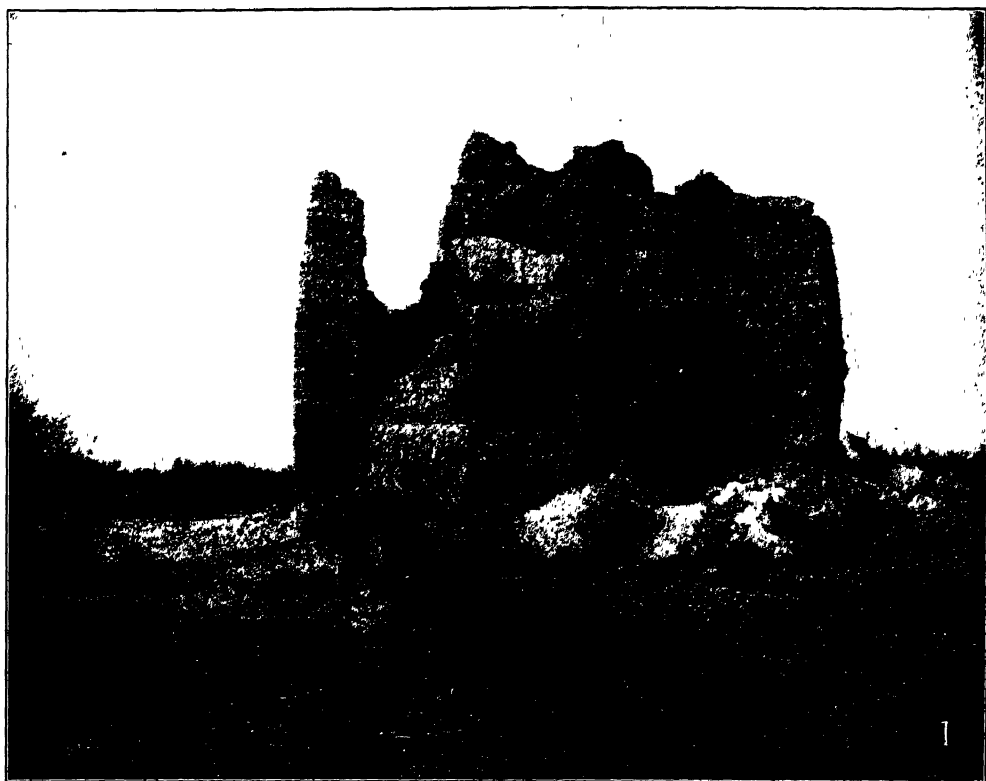
CASALMAGGIORE, kã-sãl'mã-jõ'rã. A city in the Province of Cremona, Italy, 15 miles north of Parma, on the left bank of the Po, from whose frequent inundations it is protected by embankments (Map: Italy, E 3). It has large and beautiful churches, a theatre, a gymnasium, and a public library. It manufactures pottery, glass, leather, and chemicals, and markets the wine of the surrounding country. Pop. (commune), 1901, 16,400; 1911, 17,217.

CASALS, kã-sãls', PABLO (1876-). A distinguished Spanish violoncellist. He was born in Vendrell, Catalonia, and received his first instruction from his father. In 1888-91 he studied at Barcelona with García ('cello) and Rodereda (composition), and in 1894-96 in Madrid with Breton. He made his début in 1898 at one of the Concerts Lamoureux in Paris, achieving such success that he devoted himself entirely to concertizing. His triumphs in Europe and both North and South America have been extraordinary. As a composer he has won recognition with two symphonic poems, several smaller works for orchestra, and numerous pieces for piano and 'cello and for piano and violin.

CASAMICCIOLA, kã'sã-mẽ'chõ-lã. A watering place of Italy, noted for its alkaline-saline springs, its sand and sea baths, situated on the island of Ischia, and belonging to the Province of Naples (Map: Italy, B 11). During the earthquakes of 1881 and 1883 the place was almost completely destroyed, and even at present, although the government has aided in its rebuilding, a considerable part of the town is in ruins. Pop. (commune), 1901, 3731; 1911, 3490.

CASANOVA, kã'sã-nõ'vã, FRANCESCO (1727-1802). An Italian battle painter and etcher. He was born in London, was brought up in Venice, and studied in Florence under Simonini. Later he went to Paris, where he came under the influence of Parrocel and Bourguignon, and to Dresden, where he copied the works of Wou-berman. At Paris, where he practiced 20 years, he was painter to the King and member of the Academy. His numerous pictures show vigor of execution and excellent movement, but the drawing is often faulty. Among those most popular in his day were: "Hannibal Crossing the Alps," the "Battle of Lons," and "Battle of Freiburg" (the last two in the Louvre), and a series exe-

AMERICAN PREHISTORIC DWELLINGS



1. CASA GRANDE.

2. CLIFF DWELLINGS IN THE MESA VERDE.

cuted for Catharine II of Russia, illustrating her victories over the Turks.

His brother, GIOVANNI BATTISTA (1728 or 30-95), was born in Venice and studied in Dresden under Silvester and Dietrich, in Venice under Piazzetta, and in Rome under Mengs. He gained the reputation of being a very correct draftsman and numbered among his pupils Angelica Kauffmann and Winckelmann. The latter commissioned him to make the drawings for his *Monumenti antichi*. He was appointed professor at the Dresden Academy in 1764 and director in 1776.

CASANOVA, kă'să-nô'vâ, GIOVANNI GIACOMO, DE SEINGALT, de sän'gâl' (1725-1803). An Italian poet and adventurer, author of celebrated *Memoirs*. The story of his life is told with essential accuracy in his *Memoirs*. He was born in Venice in a family of actors. Educated in Padua for the priesthood, he early showed remarkable brilliance of intellect and charm of personality. At bottom a skeptic and a sensualist, with a full realization of his own instincts and capabilities and a wonderful insight into human nature, he set about making his way in the world with a curious blend of rectitude and unscrupulousness in his ethical code that makes of him one of the most interesting examples of eighteenth-century psychology. He began his work as a preacher in Venice when a mere boy. Various irregularities made it desirable for him to seek a post elsewhere, and he entered the service of Bishop Bernardis at Martorano, where he remained three days. Returning by way of Naples to Rome, he rapidly rose in favor with the Pope, as a ward of Cardinal Acquaviva. Here too he ultimately became embroiled, and after an adventurous journey to Venice he renounced the priesthood and entered the Venetian army at Corfu. Again in Venice on the recall of the troops, Casanova found himself in the direst poverty and accepted a position as a violin player in a cabaret. A fortunate accident enabled him to render a great personal service to a noble of the Bragadin family, who ultimately adopted him and assured him a certain income. However, new intrigues again forced Casanova to leave Venice, and not till late in life (1782) did he again have settled prospects before him. His wanderings led him to every capital of Europe, even as far as Constantinople. Living by gambling, by swindling and intrigue, by patronage won with his literary ability, his social grace and wit, his knowledge of feminine nature, he came to know intimately most of the important people of Europe, including Voltaire, Haller, Cardinal Bernis, Madame de Pompadour, etc. He acted as an agent for Louis XV and as a spy for the Venetian Republic. His life shows the most astonishing variations of fortune, alternations between wealth and distress, popularity and hatred. The fêted guest of Empress Catharine becomes the miserable convict of the Venetian Piombi, whence he made a marvelous escape, the relation of which became one of his social assets. The last years of his life were spent in peace at Dux in Bohemia, where he acted as librarian for the Duke of Waldstein.

Casanova has been regarded as one of the monstrous figures of literature for the gleeful frankness with which he portrays his own career in its most intimately immoral aspects. Recent criticism has treated him more kindly. His *Memoirs* have won recognition for their enor-

mous historical value as a picture of private life in the eighteenth century, and he is credited with no mean power as a literary artist. The *Memoirs* were written in French. The principal editions are those of Rosez (Brussels, 1860-63) and Garnier (Paris, 1879-80). But neither of these reproduces the original text, owned in manuscript by Brockhaus, Leipzig, who now has a complete critical edition in preparation. The marvelous character of the episodes of the *Memoirs* has brought their truthfulness often into question; but their general reliability has been demonstrated by a long list of studies, of which the most startling are *Lettere di donne a G. Casanova*, ed. by A. Ravà (Milan, 1912), and *G. Casanovas Briefwechsel* (Leipzig, 1913), ed. by Ravà and Gugitz. See also Ravà, *Contributo alla bibliografia di G. Casanova* (Turin, 1909-10), and Tage Bull-Ravà (Vienna, 1913); A. Symonds, "Casanova at Dux," in *North American Review* (1902); Maynial, *Casanova et son temps* (Paris, 1911); Molmenti, *Cartezzi casanoviani* (Florence, 1911). The latest edition of the story of the escape from the Piombi is that of S. di Giacomo (Naples, 1911). Eng. trans. of *Memoirs* by Villars (London, 1892).

CAS'AREEP, or **CASSAREEP** (South American word). A sauce or condiment made from the juice of the bitter cassava, or manioc root. It is in the highest esteem in Guiana, where it is employed to flavor almost every dish, and it is the basis of the favorite West Indian dish called *pepper pot*. It is a powerful antiseptic, and meat can by means of it be kept for a long time quite fresh, even in a tropical climate. It is made by evaporating and concentrating the juice, which is also mixed with various aromatics. The poisonous principle of the juice is dissipated in the evaporation, so that, although the juice in a fresh state is readily fatal to life, casareep is perfectly safe and wholesome. Casareep is imported into Holland and Britain and remains unimpaired in quality for several years.

CASAREGIS, kă'să-râ'jës, GIUSEPPE LORENZO MARIE (1670-1737). An Italian jurist, born in Genoa. He studied law at Pisa and was an auditor of the Rota (q.v.) at Siena and Florence. He was an authority in commercial law and one of the first important writers on that subject. His principal work is *Discursus legales de commercio* (2 vols., 1707; vol. iii, 1729).

CASAS, BARTOLOMÉ DE LAS. See LAS CASAS, BARTOLOMÉ DE.

CASAS, EMMANUEL. See LAS CASAS, MARQUIS DE.

CASAS GRANDES, kă'săs grăn'dâs (Sp., great houses). A village in Chihuahua, Mexico, 150 miles northwest of the city of Chihuahua, celebrated for the ruins of early Mexican buildings (Map: Mexico, E 2). In the vicinity are artificial mounds from which have been excavated stone axes and various other prehistoric utensils. Similar ruins are found near the Gila, the Salinas, and the Colorado rivers. They are supposed by Bancroft to be the work of the same people, the Moquis. Consult H. H. Bancroft, *The Native Races of the Pacific States of North America*. See CASA GRANDE.

CASATI, kă-să'tê, GAETANO (1838-1902). An African explorer, born at Lesmo in upper Italy. After studying at the Academy in Pavia he entered the Italian army in 1859 and served there till 1879. On December 24 of that year he sailed for Africa under commission from the

Società d'Esplorazione Commerciale d'Africa. He followed the course of the Welle River and explored the basin of the Bahr-el-Ghazal. In 1882 he was held prisoner for some time by a native chief; in 1883 he joined Emin Pasha and was shut in with him by the Mahdi insurrection. After their release he became "resident" for Emin Pasha in the Kingdom of Kabba Rega. Although that monarch was at first friendly, he subsequently seized Casati and condemned him to death; but he escaped to Lake Albert Nyanza, where Emin Pasha rescued him in 1888. In December, 1889, Casati reached the coast with Emin and Stanley. Besides reports, he published *Dieci anni in Equatoria* (2 vols., 1891; English, *Ten Years in Equatoria*, 1891), especially valuable for its account of the Niam-Niam, whom he visited in 1883.

CASAUBON, *Fr. pron. kà/zô'bôn'*, ISAAC (1559-1614). A distinguished French classicist and theologian. He, Joseph Scaliger (q.v.), and Justus Lipsius (q.v.) formed the famous triumvirate of sixteenth-century classical scholars. He was born in Geneva. In 1582 he was appointed professor of Greek in his native town; in 1596 he was called to a similar position in Montpellier. In 1599 he was summoned to Paris by Henry IV. The influence of the Catholic opponents of Casaubon was strong enough, however, to prevent his receiving a professorship; instead he was appointed royal librarian. After the murder of the King he felt his position insecure and in 1610 crossed to England, where James I received him with favor, appointing him prebendary of Canterbury and Westminster. Casaubon was sharply attacked by his opponents because of the favor the English King showed him, and he was charged with having bartered his opinions for position. He died in Westminster, and was buried in the great Abbey. He possessed great industry, excellent critical and grammatical sense, and skill in illustration and exposition. He was the first to treat in systematic manner an important field of literary history. This he did in his masterly work, *De Satirica Græca Poesi et Romanorum Satira* (1605; last ed. by Rambach, Halle, 1774). Most of his labor was expended on editions and commentaries. The most important of these were on Strabo (1587); Suetonius (1595); Persius (1605; 4th ed., 1833, called by Scaliger "a divine book"); Polybius (1609); Polyanus, the editio princeps (1589), and especially Athenæus (1598); on this last-named commentary, his greatest work, he spent 10 years. He edited also Apuleius; Aristotle; Aristophanes; the *Historia Augustæ Scriptores*; Pliny the Younger, etc., and made important contributions to the criticism and interpretation of Dionysius of Halicarnassus; Diogenes Laërtius; Theocritus, etc. His theological interest gave rise to the works *De Libertate Ecclesiastica* (1607) and *Exercitationes Contra Baronium* (1614), in which he attacked the *Annales Ecclesiastici* of Cardinal Baronius (q.v.). These works appeal only to the scholar, but his characteristic diary, *Ephemerides*, may be relished by the general reader. It was edited by Russell (Oxford, 1850). Casaubon's *Letters* were published in Rotterdam, 1709. Consult Pattison, *Isaac Casaubon*, 2d ed. by Nettleship (Oxford, 1892), and Nazelle, *Isaac Casaubon, sa vie et son temps* (Paris, 1897).

The scholar lived on in his son, MÉRIC CASAUBON (1599-1671), born in Geneva and educated at Sedan and Oxford, who edited the works of

Marcus Aurelius, Terence, Epictetus, etc. Made successively prebendary of Canterbury, vicar of two charges, a rector, he suffered for devotion to Charles I. At the Restoration, however, he was again in favor. He wrote *De Enthusiasmo*; but perhaps his greatest work was the pious preservation of his father's manuscripts. He died at Oxford, where he had taught theology and, at the instance of Charles I, had received the degree of Doctor of Divinity.

CASAULT, kà/zô', SIR LOUIS NAPOLEON (1822-1908). A Canadian jurist, born at St. Thomas. He was admitted to the bar in 1847 and from 1854 to 1858 was a member, for Montmagny, of the Canadian Legislative Assembly. From 1867 to 1870 he represented Bellechasse in the Canadian House of Commons. He was professor of commercial and maritime law in Laval University from 1858 to 1891, puisne judge of the Superior Court of Quebec in 1870-94, and in 1894-1904 Chief Justice. He was one of the three commissioners appointed to adjust accounts between Ontario and Quebec and between those provinces and the Dominion.

CASBIN, káz-bén'. See KASBIN.

CAS/CA, PUBLICUS SERVILIUS. One of the assassins of Julius Cæsar, who, according to Plutarch, struck the first blow. This was done across the back of Cæsar's neck with a short sword, but the wound was not deadly.

CASCADE'. See WATERFALL.

CASCADE RANGE. A range of mountains in western United States and Canada, forming a northward continuation of the Sierra Nevada Range (Map: United States, A 2). It begins in northern California near the Oregon boundary and extends across the latter State and Washington into British Columbia, where the line of elevations is continued by many small groups which are deeply intersected and eroded by river and lake systems. Its direction in the United States is nearly north and south, parallel to the Pacific coast; in Oregon the main axis of elevation lies about 100 miles from the coast, while in Washington the distance increases to 150 miles. The limits of the Cascade Range in British Columbia are not clearly defined. The name, however, is commonly assigned to the entire plateau region stretching across the province from southeast to northwest, which is limited on the east by the lofty ranges of the Rocky Mountains and on the west by the Island Range. The southern section of the range is crossed by the Columbia River and by the Klamath River, both of which have cut deep gorges. In British Columbia the Fraser River occupies an extensive cañon, where it passes across the range to discharge into the Strait of Georgia.

The Cascade Range in its southern section is marked by extreme ruggedness of outline and by some of the loftiest summits in the United States. In the Shasta group of California, which defines its limit to the south, are Mount Shasta, 14,380 feet, and several other peaks over 10,000 feet in height. In Oregon it includes Mount Hood, 11,225 feet; Mount Jefferson, 10,200 feet; and Mount Pitt, 9760 feet; while in Washington is the magnificent cone of Mount Tacoma (Rainier), 14,408 feet, with many peaks of lesser altitude, including Mount Baker, 10,827 feet; Mount St. Helens, 10,000 feet; and Mount Adams, 12,307 feet. The British Columbian section contains no notable elevations, its character being rather that of a plateau dissected by numerous rivers, with a few prominences rising

above the surface to altitudes of 6000 or 7000 feet. Some summits of the Cascade Range are recently extinct volcanoes and carry heavy snow fields and glaciers. Igneous and volcanic rocks with Paleozoic strata constitute the central mass, while later sediments form the flanks. Its slopes, in part forested with firs, pine, and hard wood, are drained by the Columbia, Klamath, and Fraser rivers and by a large number of smaller streams, all of which discharge finally into the Pacific Ocean. See topography of OREGON, WASHINGTON, and BRITISH COLUMBIA.

CASCARA SEGRADA, kās-kā'rā or kās-kār'ā (properly kās-kā'rā) sā-grā'dā (Sp., sacred bark), CHITTEM BARK, or SACRED BARK. The bark of *Rhamnus purshiana*, the Californian buckthorn, a tree of the natural order Rhamnaceæ. The bark contains a crystallizable substance (cascarin), resins, a volatile oil, and malic, tannic, and oxalic acids. A fluid extract of the bark, as well as cascarin, is used for the relief of chronic constipation and sometimes in gout. After prolonged use of it constipation is cured in many cases, as its action is to increase the peristaltic action of the muscular fibres of the intestine. It is generally combined with other laxatives, and is an ingredient of many proprietary purgative medicines. See BARK; BUCKTHORN.

CASCARILLA (Sp., little bark, dim. of *cascara*, bark, husk, from *cascar*, to fall, from Lat. *cassare*, *quassare*, to shake, from *quatre*, to shake; associated by popular etymology with Lat. *cadere*, to fall). A name given in South America to many different kinds of bitter medicinal barks which form articles of commerce. Peruvian bark itself bears no other name in the districts which produce it. The name "cascarilla" is often used in medicine to denote the bark of *Croton eluteria*. This plant is a small shrub found on the low hills of the Bahama Islands. The bark contains an essential oil, cascarillin, and a resin, and is a tonic, invigorating digestion and promoting the functions of the stomach. In large doses it is very nauseating.

In medicine, cascarilla is used in the form of an infusion or a tincture, in cases of fermentative dyspepsia, chronic bronchitis, and certain fevers. It is one of the aromatic bitters and stimulates the appetite and the digestive powers, increases the flow of the digestive juices, and is a mild astringent.

CASCINE, kā-shē'nā, LE. A park about two miles long, in Florence, bordering the Arno. It is laid out in fine walks and drives and is the favorite afternoon resort of Florentine society.

CASCO BAY. A bay on the southwest coast of Maine, about 20 miles in width at its mouth, from Bald Head on the east to Cape Elizabeth on the west, and extending about 12 miles inland (Map: Maine, C 8). The bay contains hundreds of small islands, most of which are occupied as summer resorts, and affords an excellent harbor. Portland (q.v.) is located on the west side of Casco Bay.

CASE (Fr. *casse*, *caisse*, Catalan *capsa*, Portug. *caixa*, from Lat. *capsa*, box, from *capere*, to take). A receptacle for type used in printing, which is divided into compartments or "boxes," each of which contains type of one character or letter. A pair of cases consists of an upper and a lower case: the upper one contains the capitals, small capitals, and some other letters that are only occasionally required, the lower one

holding the small letters, figures, spaces, and most of the points. The places assigned to the several letters of the alphabet in the boxes of the case are not precisely the same in all printing offices, but the differences are few. The different sizes of the boxes in the lower case depend upon the comparative frequency with which the several letters occur in composition, and the position in the case allotted to each letter is

fi	fi	Em	4Bn	'	k		1	2	3	4	5	6	7	8
j						e							ff	9
!	b	c	d				i	s	f	g			fi	0
?														
z	l	m	n	h	o	y	p	w					En	Em
x											i	:	Quad-	Quad-
q	v	u	t	Spaces	a	r					-		Quadrats	

THE LOWER CASE.

such as to afford the greatest facility in composing. The letter *e*, which is most used in the English language, has a box much larger than any of the other compartments and is placed directly in front of the compositor. In the upper case the boxes are of uniform size, and the letters are placed in alphabetical order, the comparatively rare occurrence of capitals rendering it immaterial which letter is nearest the compositor's hand.

CASE. In law, primarily a cause, that is, an action or suit taken as a whole. The word is used in this general sense in the United States Constitution, which extends the judicial power of the United States to "cases in law and equity, cases affecting ambassadors, etc." In a more limited sense, a case is one side of a suit or action, the body of evidence and law presented by one of the parties. The word is also used to denote a decided cause of action already recorded and cited in argument; thus the phrase *case law* is used to designate the species of legal argument founded on the examination and citation of decided cases; hence also the phrase *leading cases*, meaning cases in which the decisions have a wide application and set forth general principles which may govern many subsequent decisions. In the United States the term *case* is often used in brief for *case on appeal*, meaning the statement laid before a court of appeal by an appellant, presenting the record and the entire evidence of the original trial, or a résumé of it. This allows the appellate court to review the findings of the jury as well as the law points involved, and in this the case differs from the *bill of exceptions*, which presents only the matters of law to the court of appeal. *Case agreed on*, or *case stated*, is a statement in which parties to a suit unite in laying before the court the facts of the case upon which they agree for a decision on the points of law involved. *Case reserved* is a statement drawn by counsel and certified to by the judge, to be used as a basis for argument on law points before a full bench of the court.

Action on the Case. A very important form of action, sometimes called *case*, in brief for *action on the case*, or, still more fully, *action of trespass on the case*. This action did not exist at early common law, but was introduced by the Statute of Westminster II, in the reign

of Edward I (1285). It was designed to remedy certain defects in the common-law practice which failed to provide an adequate remedy for some class of injuries by means of the common-law action of trespass and effected perhaps the greatest reform of legal procedure ever produced by a single statute. The phrase *action on the case* is really equivalent to *action on the circumstances*, and this form of suit avails when it is sought to recover damages for personal injuries not caused by an assault, or where the wrongful act was of such a kind that the injury was indirect or consequential. Actions to recover damages for libel or slander, for the conversion of personal property, for negligence, are examples of actions on the case. *Assumpsit* (q.v.) originated as a form of action on the case. In Great Britain the Judicature Acts have so classified injuries for which damages may be sought as in general to make this form of action obsolete; and in the United States the codes of civil procedure adopted in many States have generally abolished this and other special forms of action. In many of the States, however, the action on the case is still in common use. Consult the authorities referred to under PLEADING and PRACTICE.

CASE, AUGUSTUS LUDLOW (1813-93). An American naval officer, born in Newburgh, N. Y. He entered the navy as midshipman in 1828, served in the Mexican War, and upon the outbreak of the Civil War in 1861 was appointed fleet captain of the North Atlantic blockading squadron. Subsequently he was fleet captain of the European squadron in 1865-66, was chief of the ordnance bureau from 1869 to 1873, and in 1874, at the time of the *Virginian* affair, was placed in command of the fleet which had been assembled at Key West. In 1872 he received the rank of rear admiral and was retired in 1875.

CASE, THOMAS (1598-1682). An English divine, born in Kent. He graduated at Christ Church, Oxford, became rector of Stockport in 1645, and subsequently rector of St. Mary Magdalene, London. In 1649 he was removed from his benefice for refusal to pledge loyalty to the new system of government, and in 1651 was imprisoned in the Tower on a charge of high treason in having implicated himself in the Presbyterian plot for the Stuart restoration. During his imprisonment Case wrote a series of articles which were published afterward under the title of *Correction Instruction*. In the same year he was released, and subsequently became rector of St. Giles-in-the-Fields. He was a member of the deputation of Presbyterian clergymen sent in 1660 to congratulate the restored King, by whom he was appointed a royal chaplain. He was one of the most popular preachers of his day, and wrote several works, of which *Mount Pisgah* (1670; new abridged ed., 1836) is esteemed the best.

CASE, THOMAS. An English educator and philosopher. He was educated at Rugby and at Balliol College, Oxford (M.A., 1868), and was fellow of Brasenose (1868), tutor of Balliol (1870), lecturer at Christ Church, fellow and tutor of Corpus Christi (1882) and Waynflete professor of moral and metaphysical philosophy (1889-1910), and (after 1904) president of Corpus Christi College, Oxford. He wrote: *Materials for the History of the Athenian Democracy from Solon to Pericles* (1874); *Realism in Morals* (1877); *Physical Realism, being an Analytical Philosophy from the Physi-*

cal Objects of Science to the Physical Data of Sense (1888).

CASEHARDENING. The process of converting the surface of wrought-iron or soft-steel articles into steel of higher percentage of carbon, thereby making them harder, more resistant to abrasion, less liable to rust, and capable of taking on a better polish. Fire irons, portions of fine grate fronts, gunlocks, and other articles of limited size are commonly so treated, but the process is sometimes applied to large objects. The articles are first formed and, being heated to redness, are embedded without access of air in powdered yellow prussiate of potash and heated again. The result is that the heat decomposes the prussiate of potash, and the liberated carbon combines with the iron, forming a coating of hard high carbon steel on the surface of the articles. A former mode of case-hardening was to heat the articles, along with some animal matter, such as the parings of horns and a little common salt, from a half-hour to several hours. After being treated as described the articles were cooled in cold water, or in oil when they were of a delicate nature. Charcoal alone is also employed. The coating of steel is very thin, in the case of small articles seldom exceeding one-sixteenth of an inch. Where a thicker coating is necessary, the articles are treated several times. The process called "Harveyizing" of steel armor plate, from the name of its proposer, is similar to casehardening in that a surface exceedingly resistant to penetration by projectiles is formed by heat treatment in carbon, while the back remains soft and tough to withstand the smashing effect when the projectile is arrested in its flight. See ARMOR PLATE.

CASEIN, kâ'sé-in (Lat. *caseus*, cheese). An organic compound allied to albumin, found in the milk of the mammalia. The proportion of casein in milk varies, but averages about 3 per cent, and it may be coagulated and separated therefrom by the addition of acetic acid or of a little rennet, as in the manufacture of cheese (q.v.). In either case the casein separates as curd, which still retains attached to it some oil and salts, though the greater portion of these substances, along with the sugar, remains in the watery liquid or whey. The elementary bodies which enter into the composition of casein, and the proportion in which these are present in 100 parts, are: carbon, 53.83; hydrogen, 7.15; nitrogen, 15.65; oxygen, 22.52; and sulphur, 0.85. Casein is not affected by heat as readily as other albuminoid substances; it is not coagulated below the temperatures of 130°-150° C. It forms insoluble precipitates with solutions of the poisonous salts, acetate of lead, nitrate of silver, and bichloride of mercury, and is therefore used as their antidote.

A compound of casein with lime is now extensively used in calico printing as a substitute for albumin for the purpose of fixing certain mineral colors. The compound is prepared by dissolving casein in ammonia, evaporating the solution, and adding milk of lime to the residue. *Lactarin* is a commonly known commercial form of this compound. Solutions of casein, together with borax, in water, have been used as a substitute for gum arabic. Since 1903 casein has also been used for making *galalith*, an important substitute for ivory, celluloid, ebonite, etc. Galalith is made by treating pure casein under pressure with formaldehyde. Moist, fat-free

casein, mixed with quicklime, borax, or strong sodium silicate solution, sets to a hard insoluble mass; hence the use of casein as a cement for earthenware. The Swiss powder known as *Käseleim Pulver* is a ready-made mixture of this kind and will set to a hard mass on being moistened. Finally, as a basis of food preparations, casein is used in the form of its alkali or alkaline earth salts, which are obtained by dissolving casein in the required amount of caustic alkali, or milk of lime, or phosphate of lime, and evaporating to dryness in vacuo. See **PROTEIN**.

CASELLI, *kä-sèl'le*, GIOVANNI (1815-91). An Italian abbot and physicist, born in Siena. He was an active popularizer of science, and in 1854 established *La Riconoscenza*, a popular journal of physical science. He invented a form of electric telegraph, the "pantelegraph," which for years was in use in France. In 1865 he built an electric motor for Napoleon III.

CASEMATE (Fr., perhaps from It. *casa*, house, chamber + *matta*, fem. of *matto*, mad, weak; provincially, dark; or possibly connected with Sp. *matar*, to kill, from Lat. *mactare*, to slaughter). Originally the loopholed gallery of a bastion, constructed so that fire could be directed on an enemy with the maximum of effect and the minimum of risk. With the advent of shells the term came to be applied to the bombproof vaults of fortresses or defenses, used for shelter purposes only. Casemate batteries are bombproof vaults or galleries, containing embrasures for the guns. The most widely known examples of casemate batteries are in the British fortress of Gibraltar (q.v.). See **FORTIFICATION: SIEGE AND SIEGE WORKS**.

CASEMENT (abbreviation of *incasement*, from OF. *encasement*, casing, from Lat. *capsa*, box, from *capere*, to hold). A frame, or sash, with hinges to open and shut, forming the whole or part of the glazing of a window. German and English casements are made to open outward, and this is the usual form in the United States. French casements have two meeting leaves and open inward; they are used principally as doors opening on balconies or verandas. Also a name for a deep, hollow, circular molding, similar to the *scotia* of classical and the *cavetto* of Italian architecture. The casement is very prevalent in the Perpendicular style of Gothic architecture and is sometimes enriched with running foliage.

CASEMENT, SIR ROGER DAVIS (1864-1916). Irish revolutionist. From 1895 to 1913 he was in the British consular service, distinguishing himself for his efforts to suppress cruelty to the natives in the Congo Free State and in Brazil. In 1916, he aided in the Sinn Féin revolt. After passing some months in Germany where he was believed to have engaged in a treasonable plot, he was captured in Ireland, April 21, 1916, on landing from a German submarine, convicted of high treason, June 29, and hanged August 3.

CASERTA, *kä-zér'tà*. An episcopal city in south Italy, capital of the Province of Caserta, and a military centre (Map: Italy, J 6). It is 21 miles north of Naples, of which it might be called the Versailles or the Potsdam. The ancient town (Caserta Vecchia), founded in the eighth century by the Lombards, is on the slope of a hill and contains several deserted palaces and the twelfth-century church of San Michele; the modern town (Caserta Nuova) is on lower ground. Opposite the railway station is the

famous but now unoccupied royal palace, built by King Charles III and designed by Vanvitelli. This magnificent edifice, the construction of which was begun in 1752, forms with its four courts a huge rectangle, whose south side is 830 feet long and 134 feet high, and has 37 windows in each story. Through the middle of the rectangle runs a splendid colonnade 541 feet long, from the centre of which rises the beautiful marble stairway with 116 steps. The chapel of the palace is richly decorated and contains a number of works of art by well-known artists. The theatre of the palace has 40 boxes and 12 Corinthian columns of African marble from the palace of Serapis at Pozzuoli. Surrounding the rectangle are gardens laid out in the English fashion. The water for its fountains is brought 26 miles from Mount Taburno by an aqueduct which crosses the Maddaloni valley on a daringly constructed bridge, 1700 feet long and 190 feet high. In San Leucio, 2 miles north of the railway station, are a royal silk-spinning establishment and linen and tapestry weaving factories. In 1860 Caserta was the headquarters of Garibaldi and his army. The Province of Caserta is the ancient Campania Felix. Pop., 1881, 31,000; 1901, 33,000; 1911, 32,032.

CASE SCHOOL OF APPLIED SCIENCE. An institution for technological education at Cleveland, Ohio. It was endowed by Leonard Case in 1877 and was opened to students in 1880. The buildings of the school consist of a main building used for general recitation purposes, and separate laboratories for chemistry, physics, mechanical engineering, electrical engineering, mining engineering, and astronomy. Courses are given in these subjects and in civil engineering. These courses lead to the degree of Bachelor of Science. In 1913 the faculty numbered 45, and the students enrolled were 531. The president is Charles Sumner Howe.

CASE SHOT. A projectile discharged from cannon and consisting of a number of balls or other particles inclosed in a case or covering from which they are released at the muzzle of the gun. Case shot consisted either of grape or canister (qq.v.). In modern artillery ammunition, *shrapnel* has entirely replaced *case shot*, which is no longer used. See **ARTILLERY; ORDNANCE; PROJECTILES**.

CASEWORM, or **CADDIS WORM**. See **CADDIS FLY**.

CA'SEY, EDWARD PEARCE (1864-). An American architect, born at Portland, Me. He was educated at Columbia University and the Ecole des Beaux-Arts, Paris. In 1892-97 he served as architect for completing the Congressional Library Building, Washington. In 1893 he was one of the prize winners on the City Hall Competition (New York). With W. H. Burr he made the accepted designs for the memorial bridge across the Potomac River, Washington, in 1900, and with H. M. Shady he won first prize in competition for the Grant Monument in Washington in 1902. He was also architect of the Memorial Continental Hall and the Connecticut Avenue Viaduct in Washington, D. C.

CASEY, SILAS (1807-82). An American soldier, born at East Greenwich, R. I. He graduated from West Point in 1826, served in the Seminole and Mexican wars, and for services in the latter received the brevet rank of lieutenant colonel. In 1861, with the rank of brigadier general of volunteers, he organized and disciplined the recruits at Washington, D. C., and

later in the war saw service in the field and distinguished himself at the battle of Fair Oaks. From 1863 to 1865 he served as president of the board appointed to examine candidates for officers in the colored regiments, and in the latter year he was brevetted major general. He retired in 1868. He published *System of Infantry Tactics* (2 vols., 1861) and *Infantry Tactics for Colored Troops* (1863).

CASEY, THOMAS LINCOLN (1831-96). An American military engineer, born at Sacketts Harbor, N. Y. He graduated at West Point in 1852, entered the engineer corps of the army, and passed through all grades of the service until, in 1888, he became chief of engineers and brigadier general. As superintending engineer of public buildings and grounds in the District of Columbia, he had charge of the Potomac Aqueduct, the completion of the Washington Monument, and the State, War, and Navy Department buildings, and the construction of the Army Medical Museum and Library. In 1889 Congress charged him with the duty of constructing the new Congressional Library Building.

CASGRAIN, kás'grán', HENRI RAYMOND (1831-1904). A Canadian biographer and historian, born at Rivière Ouelle, Quebec. He was educated at the Collège Sainte-Anne, P. Q., studied theology at the Quebec Seminary, and was ordained a priest in 1856. He was a professor at St. Anne's until 1859 and priest at the Basilica, Quebec, from 1860 until 1873. In 1889 he was elected president of the Royal Society of Canada. Among his works may be mentioned: *Légendes canadiennes* (1861); *L'Histoire de la Mère Marie de l'Incarnation* (1864); *Histoire de l'Hôtel Dieu de Québec* (1878); *Biographies canadiennes* (1885); *Un pèlerinage au pays d'Évangéline* (1888); *Montcalm et Lévis* (2 vols., 1891). He prepared, in conjunction with Abbé Laverdière, Desbarats' edition of the *Œuvres de Champlain* and the *Journal des Jésuites*; and he wrote the introduction to the *Œuvres complètes d'Octave Crémazie*.

CASGRAIN, PHILIPPE BABY (1826-). A Canadian lawyer and historian. He was born in the city of Quebec, was educated at St. Anne's College, and was called to the bar in 1850. He was for several years deputy prothonotary of the Superior Court of the province, and later became clerk of the Circuit and Revision Court. In 1872 he was elected a Liberal member of the House of Commons, retaining his seat until 1891. In 1892 he was president of the royal commission to inquire into the Montreal and Sorel Railway grant and payment. He favored the formation of a Canadian navy, and was a member of the executive committee of the Quebec branch of the Navy League. In recognition of his literary abilities and of his historical investigations, chiefly concerning matters of local and French-Canadian interest, he was elected president of the Literary and Historical Society of Quebec in 1898, 1899, and 1906. His publications include: *Lettelier de Saint Just et son temps* (1885); *La fontaine de Champlain à Québec* (1888); *La vie de Joseph-François Perrault* (1898); *Les Plaines d'Abraham* (1900); *Seconde bataille des Plaines d'Abraham et de Sainte-Foye* (1900); *La maison de Montcalm* (1902); *La maison de Borgia* (1904); *Le moulin de Dumont* (1905); *Cadet, sa maison et sa résidence à Québec* (1906); *A Few Remarks on Various Gallicisms and French Locutions in the Plays of Shakespeare* (1907); *La Chapelle et le tom-*

beau de Champlain (1907); *Notre système judiciaire* (1911); besides contributions to the *Transactions of the Royal Society of Canada* and the *Transactions of the Quebec Literary and Historical Society*.

CASGRAIN, THOMAS CHASE (1852-). A Canadian lawyer and statesman. He was born in Detroit, Mich., was educated at the Quebec Seminary and Laval University, and was called to the Quebec bar in 1877. In 1882 he was appointed crown prosecutor of the District of Quebec, but he afterward removed to Montreal and practiced his profession there. In 1885 he was junior crown counsel at the trial for high treason of Louis Riel (q.v.). He was a Conservative member of the Quebec Legislature in 1886-90 and again in 1892-96, during which period he was Attorney-General and procured the enactment of a law against corrupt practices at elections. In 1894 he became bâtonnier of the bar of Quebec and also bâtonnier-général of the provincial bar, and in the same year he was chairman of the royal commission to revise and amend the code of civil procedure. He was a member of the House of Commons in 1896-1904, was elected president of the provincial Conservative Association in 1909, and in 1912 became chairman of the Canadian section of the International Waterways Commission.

CASH. Formerly the unit of Chinese money and sole official coin of China. It is a small round copper coin, with a square hole in the centre, and is equal to about one-eleventh of a cent in United States money. It still circulates, but a law of May, 1910, created a new monetary system based upon the Mexican silver dollar, the smallest coin being one-tenth of a cent.

CASH CARRIER. See PNEUMATIC DISPATCH.

CASH'EL (Ir. *Carsiol*, habitation in the rock). A town in Tipperary Co., Ireland, 105 miles southwest of Dublin (Map: Ireland, D 4). It lies at the foot of the Rock of Cashel, a limestone elevation about 300 feet in height, on the summit of which are the most imposing ruins in Ireland. They consist of St. Patrick's Cathedral, the largest as well as the most remarkable in the country, founded 1169, burned 1495, and afterward repaired; a stone-roofed chapel, built in 1127 by Cormac McCarthy, King of Munster, the most perfect specimen of the kind in the country; a round tower 80 feet high and 50 in circumference; and the "Cross of Cashel." Hore Abbey, founded by the Cistercians in 1272, lies at the base of the rock. The round tower is built of freestone, but the other ruins of limestone. At Cashel, in 1172, the Irish princes first acknowledged the authority of the English King. Pop., 1901, 2938; 1911, 2813. Consult White, *Cashel of the Kings* (2 vols., Clonmel, 1863-66).

CASHEW (ká-shō') **NUT** (Ger. *Acajou-nuss*, Sp. *cayou*, from Hind. *kājū*, *kānjū*). The fruit of a tree, *Anacardium occidentale*, of the family Anacardiaceæ. This is a spreading tree, 20 to 40 feet in height, and is a native of the tropical parts of both hemispheres, perhaps being primarily of American origin. It abounds in a milky juice, which turns black on exposure to the air and is used for varnishing, but is so acrid as to produce painful inflammation when it comes in contact with the skin of some persons, or when they are exposed to its fumes. It is sometimes used to protect books and wood-work against ants. The fruit of this tree is a

kidney-shaped nut about an inch long, seated on the thicker end of a pear-shaped, fleshy stalk, which varies in size from that of a cherry to a medium-sized pear. The shell is double; the outer shell is ash-colored and very smooth, and between it and the inner shell is a very caustic black juice. The kernel is oily and very pleasant and wholesome, and is in common use as an article of food in tropical countries when roasted, being made into puddings and in various ways prepared for the table. In the West Indies it is put into wine, particularly old Madeira wine, to which it is thought to communicate a peculiarly agreeable flavor, and for this use it is sometimes imported into Great Britain. It is also, for the same reason, sometimes an ingredient in chocolate. The fleshy stalk, sometimes called the cashew apple, varies in size and is white, yellow, or red. It is perfectly free from acidity, is acid and eatable, very pleasant and refreshing, and much used by the inhabitants of the countries in which the tree grows. A very pleasant vinous liquor is obtained from it by fermentation; and this, by distillation, yields a spirituous liquor which is highly esteemed for its flavor. A gum which exudes from the bark of the tree, quite distinct from the milky juice already mentioned, is bland and very similar to gum arabic. For illustration, see Plate of CARNATIONS.

CASHGAR, kâsh-gâr'. See KASHGAR.

CASHIBO, kâ-shê'bô. A savage and reputedly cannibal tribe of Panoan stock, on the Pachitea tributary of the Upper Ucayali, Peru. Subtribes are the Buninahuas and Puchanahuas. They are said to eat their old people at death, asserting that they do this in preference to having them become food for worms. Until recently they were at war with the whites and with all other tribes, having repeatedly killed the missionaries who attempted to civilize them. They are said to be of rather light complexion. Some of the men are bearded and wear long shirts. The women go entirely naked until after marriage. The name signifies a bat. Consult works cited under PANOAN.

CASHERING (OF. *casser*, to discharge, from Lat. *cassare*, to destroy, from *cassus*, empty). The annulling or cancellation of the commission of a military or naval officer, as a punishment. Formerly it was a very severe form of dismissal from the service and usually was not resorted to except in cases of disgraceful conduct. It absolutely precluded reinstatement. At the present time, in the United States military service, there is no practical difference between the words *cashiered* and *dismissed from the service*. See ARTICLES OF WAR.

CASHMERE, kâsh-mêr'. See KASHMIR.

CASHMERE GOAT, or SHAWL GOAT. See GOAT.

CASH REGISTER. See CALCULATING MACHINES.

CASILINUM. See CAPUA.

CASIMIR, kâs'f-mêr, properly KAZIMIERZ. The name of a number of Polish princes and kings.—CASIMIR I, the Restorer, King of Poland (1040-58), was the son of the Polish King, Mieczyslaw II, and a German princess, Ryxa, who ruled during Casimir's minority. He strengthened Christianity in his dominions and founded two monasteries. He married a Russian princess and so became the brother-in-law of Henry I of France.—CASIMIR II, known as the Just, was the youngest son of Boleslas III. His father,

who died in 1139, had divided the kingdom among his four sons, but he ruled over reunited Poland from 1178 and died in 1194. Casimir showed himself an able ruler and laid the foundations of the Senate. He died much beloved by his subjects.—CASIMIR III, the Great, was born about 1310 and succeeded his father, Ladislaus Lokietek, as King of Poland, in 1333 and ruled till 1370. His possessions were threatened by the Teutonic Knights and the King of Bohemia, but he succeeded in winning the friendship of both. He secured partial control of Red Russia in 1344 and repelled the Tatars who threatened Poland. He gave the Bishop of Galicia the title of Metropolitan. He developed commerce, protected the Jews and Germans, who made many settlements in his domains, and improved the condition of the peasants, so that he is known as King of the Peasants. In 1364 he founded the University of Cracow, after the model of Bologna. He reconstructed the whole administration and made Poland a power in Europe. He had three wives and two mistresses, one a Jewess. Casimir was the last of the dynasty of the Piasts.—CASIMIR IV (1427-92), King of Poland and Grand Duke of Lithuania, was the son of Ladislaus Jagiello. The Poles, after the death of King Ladislaus III in the disastrous battle of Varna in 1444, invited his brother, Casimir, to accept the crown. This he did reluctantly in 1447. His determination to strengthen the royal power led to a threat of deposition by the nobles, and from that time Poland became more and more an aristocracy. Casimir waged a long war with the Teutonic Knights, who were compelled in the Treaty of Thorn (1466) to cede West Prussia to Poland and to render homage for East Prussia. In this reign Latin became the official language and part of the curriculum of the schools. Of his six sons, three succeeded each other on the throne of Poland, the eldest became King of Bohemia and Hungary, a second was made a cardinal, and a third was canonized by Paul V. Consult Morfill, *Poland* (New York, 1893).

CASIMIR-PÉRIER, kâ'zê'mêr' pâ'ryâ', JEAN PAUL PIERRE (1847-1907). President of the French Republic in 1894 and 1895. He was born in Paris, Nov. 8, 1847. His father, Auguste Casimir-Périer, was Minister of the Interior in the administration of Thiers, and his grandfather was Premier under Louis Philippe. Jean Paul Casimir-Périer was decorated with the Legion of Honor for his conduct in the Franco-Prussian War. After the war he entered the public service and held office in the Department of the Interior, of which his father was then head. He was elected to the Chamber of Deputies in 1874, and from December, 1877, to January, 1879, served as Undersecretary in the departments of Public Instruction and War. Because of the traditions of his family, he was regarded as having Orleanist leanings, but he always acted as a moderate Republican. In 1890 he was elected Vice President of the Chamber of Deputies, and in 1893 he became President of the Chamber, resigning December 3, when he became President of the Council and Prime Minister under President Carnot. The ministry over which he presided distinguished itself by its firm attitude at a period of great disorder. He resigned May 22, 1894, and on June 27 he was elected, on the first ballot, to succeed the murdered Carnot as President of the Republic. He surprised the world by resigning, Jan. 15,

1895, and retiring from public life. He had been embarrassed by factional politics, and he chafed at the restrictions imposed by the French constitution upon the President. His own ministers snubbed him, and even transacted important business of state without consulting him. Many rumors were in circulation afterward connecting his resignation with the Dreyfus case, and complications with Germany growing out of the latter. The ex-President appeared as a witness in the Zola trial, a sequel to the Dreyfus affair, but the rulings of the court shut out all his testimony that was of any importance or public interest.

CASINO, ká-sē'nò (It. dim. of *casa*, house, Lat. *casa*, cottage). In Italy, a pleasure house, or summerhouse, or a place for social reunions. The Italian nobles have long had casinos detached from the palaces in which they live, whither they can retreat and enjoy themselves, and it is probable that the public casinos were the result of an attempt made by the middle classes to imitate their superiors. At the present time a casino is usually a place where musical or dancing soirées are held, containing a conversation room, billiard room, and café; but the name is very indefinitely applied in the United States.

CASINO. See **CASSINO**.

CASINO, MONTE. See **MONTE CASSINO**.

CASINUM. The name of a town in ancient Italy, on whose site stands the modern Cassino (q.v.).

CASLON, WILLIAM (1692-1766). An English type founder, born at Cradley, Worcestershire. He was recognized as the greatest stamp cutter and type founder of his day. The library of the American Antiquarian Society, at Worcester, Mass., contains the earliest specimen of his printing types in book form. It is entitled *A Specimen of Printing Types by William Caslon and Son* (1763).

CASORIA, ká-sò'rè-à. A city in south Italy, 6 miles north of Naples. It has many churches and beautiful streets (Map: Italy, D 10). The district produces silk and wine. Pop. (commune), 1881, 10,000; 1901, 12,905; 1911, 14,220.

CASPARI, ká-spä'rè, KARL PAUL (1814-92). A German Lutheran theologian and Orientalist. He was born, of Jewish parents, in Dessau, Anhalt, studied in Leipzig and Berlin, became a convert to Christianity in 1838, and was appointed instructor of theology in the University of Christiania, Norway, in 1847. In 1857 he was made full professor. He wrote many philological and theological works and made an especial study of the so-called ecumenical creeds. His principal publications are the *Grammatica Arabica* (1844-48); *Beiträge zur Einleitung in Jesaya* (1848); *Alte und neue Quellen zur Geschichte des Taufsymbols und der Glaubensregel* (1879).

CASPE, ká'spá. A town in the Province of Saragossa, Spain, on the Guadalupe, almost at its confluence with the Ebro, 50 miles southeast of Saragossa (Map: Spain, E 2). It has a fine Gothic college building, an ancient castle, and several ecclesiastical establishments. Olive and mulberry trees are extensively cultivated, and coal and iron are mined in the neighborhood. A congress of Aragonians, Catalonians, and Valencians assembled here in 1412 to settle the royal succession. Pop., 1900, 7808; 1910, 8878.

CASPER. A town and the county seat of Natrona Co., Wyo., 150 miles (direct) northwest

of Cheyenne, on the Chicago and Northwestern and the Chicago, Burlington, and Quincy railroads, and on the Platte River. It is the site of old Fort Casper, is the seat of the Wyoming General Hospital, and has a Carnegie library. Casper carries on a large trade in wool, live stock, and oil, and has a large petroleum by-product plant. The water works are owned by the town. Pop., 1890, 544; 1900, 883; 1910, 2639; 1920, 11,447.

CASPER, kás'pér, JOHANN LUDWIG (1796-1864). A German physician. He was born in Berlin and studied at the university of that city and in Halle and Göttingen. In 1820 he became lecturer in the University of Berlin and in 1839 full professor. From 1841 he was in charge of the medico-legal institute connected with the university. He exerted great influence, and his advice was constantly sought by the government. His *Beiträge zur medizinischen Statistik und Staatsarzneikunde* (1825-35) marks the first serious attempt at the establishment of a science of medical statistics. This work was followed by the *Denkwürdigkeiten zur medizinischen Statistik und Staatsarzneikunde* (1846), by which Casper established himself as a high authority on this subject. A later work is entitled *Praktisches Handbuch der gerichtlichen Medizin* (1856; 8th ed., 1889). His other works include: *Klinische Novellen zur gerichtlichen Medizin* (1863); *Kritische Repertorium für die gesammte Heilkunde* (1823); *Vierteljahrsschrift für gerichtliche und öffentliche Medizin* (1852).

CASPIAN SEA (trans. of Lat. *Mare Caspium*, Gk. *Κασπία θάλασσα*, *Kaspia thalassa*, *Κάσπιος πέλαγος*, *Kaspion pelagos*). A tideless inland sea, which is becoming saltier through evaporation and which is situated on the boundary between Europe and Asia, and bordered on the north by the Russian provinces of Astrakhan and Uralsk, on the east by Uralsk and Russian Turkestan, on the south by Persia, and on the west by Persia, Transcaucasia, northern Caucasia, and Astrakhan. The Caspian Sea is the largest inland body of water in the world. It extends about 700 miles in a north to south direction and has a width varying from more than 100 to nearly 300 miles, and an area estimated at 168,765 square miles. The coast line is diversified by numerous capes and by several bays or gulfs, of which the most prominent are Czarevitsa Bay and Kara Bogaz Gulf, on the east coast. The depression occupied by the Caspian Sea is a part of a great basin which in recent geological times included the Aral Sea and the Black Sea and probably connected by an arm with the Arctic Ocean. The northern part of the Caspian depression is shallow, the depth of water being generally less than 75 feet, but in the southwest part, where the shore line conforms to the slopes of the Great Balkan, the Elburz, and the Caucasus Mountains, the depth reaches 2000 feet and in places even 3000 feet. According to recent measurements, the water level is about 85 feet below that of the Black Sea, and while rising and falling periodically with the seasons, it experiences no appreciable permanent change. The waters in the southern part are saline, but in the northern shallow portion they are sufficiently fresh to freeze over in winter. The average salinity is by no means excessive. It has been estimated at three-eighths of that of the ocean. The Caspian Sea receives the drainage of

the Volga, whose basin covers an area of 550,000 square miles, of the Ural, Emba, Kur, and of many less important rivers. According to historical records, the Amu Darya also has been a feeder of the Caspian Sea, although now it flows into the Aral Sea. The Caspian Sea is of great commercial importance to the Russian Empire, as it forms, with the Volga River, a natural waterway between the European and Asiatic provinces. Communication has been established with the Baltic Sea by way of the Volga by means of canals. The great oil fields on the Apsheron Peninsula, near Baku, thus find an outlet to north Europe, while the crude and refined petroleum is also shipped by rail or transported through a pipe line to Batum, on the Black Sea. The Caspian Sea has great salmon and sturgeon fisheries. Its shores are noted for the caviar which is exported by the natives. The presence of seals and herring is an interesting zoological phenomenon. The most important Russian towns on the Caspian Sea are Astrakhan, at the embouchure of the Volga, Baku, Petrovsk, and Krasnovodsk, the last mentioned being the western terminal of the Transcaspian Railway. Enzeli, Khorrema, and Aliabad are Persian ports.

CASQUE, *kask*. See **HELMET**.

CASS, **GEORGE WASHINGTON** (1810-88). An American engineer and railway president. He was born at Dresden, Muskingum Co., Ohio, graduated in 1832 at the United States Military Academy, and resigned from the army in 1836 with the rank of first lieutenant of infantry. Between 1849 and 1854 he was active in extending and perfecting the service of the Adams Express Company from Boston to the South and West and in 1859-62 was president of the company. He was president from 1862 to 1884 of the Pittsburgh, Fort Wayne, and Chicago Railway, from 1869 to 1874 of the Grand Rapids and Indiana Railway, and from 1871 to 1873 of the Northern Pacific Railway.

CASS, **LEWIS** (1782-1866). An American statesman. He was born on Oct. 9, 1782, at Exeter, N. H., and was the son of Jonathan Cass, a blacksmith by trade, who joined the Revolutionary army, rose to the rank of captain before the close of the war, reentered the military service, removed to Ohio, and attained the rank of major. The son attended Phillips Exeter Academy, taught school for several months at Wilmington, Del., and followed his father to Marietta, Ohio, in 1799 or 1800. He studied law in the office of R. J. Meigs, later Governor of Ohio, was admitted to the bar in 1802, and in 1804 was elected prosecuting attorney of Muskingum County. Two years later he was elected a member of the Ohio Legislature and in the same year married a daughter of the Revolutionary leader, General Spencer. As a member of the Legislature, Cass was active in the advocacy of measures to thwart the intrigues of Aaron Burr (q.v.), and, in recognition of his services, President Jefferson appointed him in 1807 to a Federal marshalship, which he held for six years. In the War of 1812 Cass entered the service as colonel of Ohio volunteers, took part in Hull's disastrous attempt to invade Canada, strongly condemned that officer's surrender of Detroit, and was the chief witness against the defendant in the Hull court-martial at Albany, N. Y. (See **HULL**, **WILLIAM**.) He was appointed major general of Ohio militia in December, 1812, a colonel in the regular army

in February, 1813, and a brigadier general in the regular army in March, 1813; took an active part in the campaign of 1813 under General Harrison (q.v.), and on October 29 of that year was appointed Governor of the Territory of Michigan. Relations with the English and the Indians, as well as the internal conditions of a frontier territory, made the office particularly burdensome and enhanced the value of his services therein. During his long term of office he administered the affairs of the territory under his jurisdiction (which even after the organization of Indiana in 1818 included all the land as far west as the Mississippi and north of the northern line of Illinois) with the greatest ability and good judgment, making as many as 22 important treaties with the Indians, establishing an orderly and efficient civil government, and steadily upholding the dignity of the national government against the frequent and unwarranted encroachments of the British authorities in Canada. In 1831, upon the reorganization of Jackson's cabinet, he was appointed Secretary of War, which office he held during the Black Hawk and first Seminole wars and the nullification movement in South Carolina. In 1836 he was sent by Jackson as Minister to France, and during his residence in Paris attracted attention abroad, besides winning great popularity at home, by protesting vigorously against the quintuple treaty for the suppression of the slave trade, which involved the right of search and which, owing largely to the influence of Cass, the French government refused to ratify. He resigned in 1842, owing to his emphatic disapproval of the Ashburton Treaty just negotiated by the Secretary of State, Mr. Webster. He was informally proposed for the presidency as early as 1842, but although, by favoring the annexation of Texas, he placed himself in harmony with the controlling element of his party, he failed to secure the Democratic nomination in 1844. Michigan, in the following February, elected him to the United States Senate, where he upheld the extreme American claims to the territory of the far Northwest. He opposed the Wilmot Proviso (q.v.) as untimely, and in a letter of Dec. 24, 1847, to A. O. P. Nicholson, of Nashville, Tenn., first definitely formulated the doctrine which later became known as that of "squatter sovereignty." The Democratic Convention of 1848 nominated him for the presidency, but the Van Burenites, or "Barnburners" (q.v.), of New York, bolted the Democratic ticket, and the Whig candidate, General Taylor, was elected.

In January, 1849, Cass was elected to the Senate, to fill the vacancy caused by his own resignation upon entering the presidential campaign, and two years later he was again elected for the full term. He favored Clay's compromise measures of 1850 (q.v.), upheld the Fugitive Slave Law (q.v.), and went with those of his party who voted for the Kansas-Nebraska Bill. He was a candidate for the presidential nomination in the Democratic Convention of 1856, and his defeat was intensified by the election in Michigan of a Legislature strongly Republican, which resulted in his retirement from the Senate. President Buchanan called him to the cabinet as Secretary of State, an office which he resigned in December, 1860, upon the President's refusal to reinforce the forts at Charleston, S. C. His closing years were spent in Detroit, where he was a pronounced supporter of

the Union in the face of those who were at war against it. He died in Detroit, June 17, 1866, in his eighty-fourth year.

His latest biographer, McLaughlin, estimates his character in the following words: "He was a great American statesman, building up and Americanizing an important section of his country, struggling in places of trust for the recognition of American dignity and for the development of generous nationalism. With the great slavery contest his name is inseparably connected; he stood with Webster and Clay for union, for conciliation, for the Constitution as it seemed to be established. He was one of those men whose broad love of country and pride in her greatness, however exaggerated, however absurd it may seem in these days of cynical self-restraint, lifted her from colonialism to national dignity, and imbued the people with a sense of their power. He has frequently been called a 'dough-face,' and a 'Northern man with Southern principles,' but, though he appears to have courted the Southern vote, his attitude seems never to have been one of weak subservience. His persistent and thorough distrust and dislike of Great Britain, his belief in the doctrine of 'manifest destiny,' and the fact that he belonged to the older school of conservative statesmen, who put the integrity of the Union before everything else, are perhaps truer explanations of his political career." Besides numerous magazine articles on Western and Indian affairs, he published *Inquiries Concerning the History, Traditions, and Languages of the Indians Living within the United States* (1823), and *France: Its King, Court, and Government* (1840). Throughout his life he was deeply interested in American history, and his various publications are still of value, "real additions to knowledge," says his biographer. He was also an outspoken advocate of temperance. His life has been written in the *American Statesmen Series*, by Andrew C. McLaughlin (Boston, 1891), who studies his career as that of a "representative pioneer in the old Northwest," one of the chief purposes of the volume being to show the development of that region and to trace the growth of its political life. Before the death of General Cass, W. L. G. Smith wrote the *Life and Times of Lewis Cass* (New York, 1856), in the preparation of which he had access to a diary which was kept by Cass on a tour in the Levant. Schoolcraft published the *Outlines of Cass's Life and Character* (Albany, 1848); and Young, the *Life and Public Service of Gen. Lewis Cass* (Detroit, 1852).

CASSABA, kās-sā'ba, or **KASSARA**. A town in Asia Minor, 163 miles east of Smyrna (Map: Turkey in Asia, B 3). It carries on a flourishing trade with the surrounding district in cotton, silkworms, and melons. Recent excavations indicate that it stands on the site of the ruins of an ancient city. In 1865 a large portion of the town was destroyed by fire, and in the same year there were many deaths from cholera. Pop., about 23,000, three-fourths of whom are Mohammedans.

CASSAGNAC, kās-sā'yāk'. See **GRANIER DE CASSAGNAC**.

CASSAN'DER (Gk. *Káσσανδρος*, *Kassandros*) (c.354-297 B.C.). King of Macedonia, son of Antipater. In 323 B.C. he was sent to Alexander in Babylon to defend Antipater against the false accusations of his enemies. When Antipater, who was in charge of Macedonia, died in 319

B.C., he appointed, not Cassander, but Polysperchon, as his successor. Cassander determined to contest the succession and allied himself with Antigonos in Asia. Polysperchon joined with Olympias, the mother of Alexander. When Cassander appeared in Greece, many states joined his standard. He finally secured possession of Olympias, Roxana, and the young son of Alexander, and, after putting to death the first and imprisoning the others, he married, in 316 B.C., Thessalonica, half-sister of Alexander. In her honor he built and named the town of Thessalonica in Macedonia. Next year he rebuilt Thebes, which had been destroyed by Alexander, and immediately after entered upon a war with Antigonos. Peace was concluded in 312 B.C., and soon after Cassander strengthened his position as supreme ruler in Macedonia by causing Roxana and her son to be put to death. Later he joined forces with Lysimachus, Ptolemy, and Seleucus, to oppose Antigonos, and Antigonos was defeated and slain at the battle of Ipsus in 301 B.C. By this victory Cassander completely secured Macedonia and Greece. In 297 he was succeeded by his son Philip.

CASSAN'DRA (Gk. *Kάσσανδρα*, *Kassandra*). In Homer, daughter of Priam and Hecuba, carried to Greece by Agamemnon, and there murdered by Clytemnestra. Other early epics told how at the capture of Troy she fled to the temple of Athena and clasped the image of the goddess, whence she was torn by the Locrian Ajax, who paid dearly for his sacrilege. She first appears as a prophetess in Pindar. According to the usual story, Apollo had loved her and gave her prophetic art, but, when she refused to keep her promise and yield to his suit, he took away all belief in her prophecies. Accordingly her warnings against the keeping of Helen and the admittance of the wooden horse were disregarded. The story of her return with Agamemnon and her murder by Clytemnestra is told in the *Agamemnon* of Æschylus.

CASSANO AL JONIO, kās-sā'nō ál yō'ná-ō. A city in the Province of Cosenza, south Italy, 42 miles north of Cosenza (Map: Italy, L 8). It has sulphur springs, a cathedral, an Episcopal seminary, and an ancient castle in the heart of the city on a high rock. The country produces large quantities of olive oil. Pop., 1901, 8700; 1911, 8552.

CASSANO D'ADDA, kās-sā'nō dād'dá. A town in the Province of Milano, north Italy, on the right bank of the Adda, 16 miles east of Milan (Map: Italy, D 2). It has silk factories and has been the scene of three bloody battles—the first in 1158, between the Milanese and Emperor Frederick; the second, Aug. 16, 1705, when the French under the Duke of Vendôme inflicted on Prince Eugène his only defeat; the third, April 27, 1799, when the Russians and Austrians under Suvaroff defeated the French under Moreau. Pop. (commune), 1901, 8782; 1911, 9150.

CASSARD, kās'sár', JACQUES (1672-1740). A French naval officer, born in Nantes. During the famine of 1709, while commanding two ships in the Mediterranean, he successfully convoyed through the English squadrons 26 transports laden with wheat bought in Barbary and bound for Marseilles. In 1710 he released a convoy of wheat blockaded in Sicily by an English fleet and safely brought it to Toulon; and two years later, with eight vessels, he attacked the Portuguese colonies for ransom and, after seizing St.

Eustache, sailed for Martinique with spoil of great value. In 1713 Cassard was declared by Duguay-Trouin to be the greatest mariner of his day. Afterward he became involved in a quarrel with Cardinal Fleury, by whom he was accused of irregularity in his accounts, was imprisoned, and died after a captivity of 15 years.

CASSATION (Fr., from Lat. *cassare*, to annul, from *cassus*, empty), COURT OF. The supreme judicial tribunal of France. In French law the act of annulling the decision of a court is called *cassation*, and the function of cassation, as regards the judgments of all the other courts, is assigned to a special tribunal, called the Court of Cassation. The present organization and powers of the court date from the constitution of the revolutionary year VIII (1799-1800), which enacted that there should be "for the whole of France a tribunal of cassation, which shall pronounce on demands for cassation against judgments in the last resort pronounced by the tribunals," and that this supreme tribunal shall pronounce no judgment on the foundation or merits of the cause, but that, in case of its breaking the judgment pronounced, it shall remit the cause to the tribunal appealed from to pronounce another. Substantially the institution has retained its original character, notwithstanding all the changes of government which have occurred in France. The demand for cassation can be made only by the parties to the suit, or by the procureur-général of the Court of Cassation, acting in the public interest. Criminal as well as civil judgment may be reviewed by the court, even, under certain circumstances, the judgments of justices of the peace and of courts-martial, military and naval. The delay allowed for bringing a civil case before the Court of Cassation is three months for persons domiciled in France. In criminal matters the procedure is much more prompt, three full days only being allowed to the person condemned to bring his action of cassation, and the same space being given to the procureur-général. In all criminal and police cases the Court of Cassation may pronounce judgment immediately after the expiration of this time and must do so within a month. The court is divided into three sections, one of which deals exclusively with criminal matters. It consists of a president, who has the title of *first* president, and three vice presidents, who are called presidents, 45 counselors or ordinary judges, a procureur-général, or public prosecutor, 6 substitutes, who have the title of advocates-general, and several inferior officers. The presidents and counselors are named by the executive for life, the other officers being removable at pleasure. No judgment can be pronounced unless 11 judges are present, the decision being determined by the majority. Where the numbers are equally divided, five judges are called in, and cases of peculiar difficulty may be judged by the three sections united. The whole court, when presided over by the Minister of Justice, possesses also the right of discipline and censure over all judges for grave offenses not specially provided for by the law. When thus constituted, the Court of Cassation may suspend the judges of the ordinary courts from the exercise of their functions and call them to its bar. The procureur-général of the Court of Cassation likewise possesses a surveillance over the procureurs-généraux of the ordinary or inferior courts. See **APPEAL**; **COURT**.

CASSATT', ALEXANDER JOHNSTON (1839-1906). An American railway president, born in Pittsburgh, Pa. He studied at Heidelberg and at the Rensselaer Polytechnic Institute, and from 1861 to 1882 rose in the service of the Pennsylvania Railroad from rodman to first vice president. In 1890 he became president of the Pennsylvania Railroad, and it was due to his efforts that this road gained a terminal in New York City.

CASSATT, MARY (1845-1926). An American figure and portrait painter. She was born at Pittsburgh, Pa., and passed her youth in Chester County. In 1875, after a brief course at the Pennsylvania Academy of Fine Arts, Philadelphia, she went to Europe. She studied the masters of the Renaissance in Italy, and in Spain the paintings of Velasquez, who exercised a strong influence on her art. In 1879 she removed to Paris, where she thereafter resided. She allied herself with the Impressionists and is considered one of the principal representatives of that movement in France. She studied principally with Degas, from whom she learned her true and vigorous line; but also with Renoir, whose influence is seen in her brilliant and luminous color. Her subjects are almost invariably women and children, particularly mother and child, in the environment of home. The children, especially, are depicted with truth, originality, and a remarkable power of observation, but without prettiness. Among her best-known paintings are: "The Bath," "Breakfast in Bed," "Mother's Caress," "Children Playing with a Cat," "In the Garden," "At the Mirror," "Maternity," "Child Playing with a Dog," "Child's Toilet," "In the Box." At the Chicago Exposition of 1893 she decorated the north tympanum of the Woman's Building with a mural painting entitled "Modern Women." Miss Cassatt is represented in the Luxembourg by "The Young Mother," a pastel; in the Metropolitan Museum, New York, by "Mother and Child," and in the museums of Boston and Worcester by similar subjects. Avoiding the Salon, she exhibited only with the Impressionists. Special exhibitions of her work have been held in Paris, and twice in the United States—in New York in 1898, in New York and Boston, 1909. Of some celebrity also are her tinted etchings, the best known of which is a series of 10 entitled "Maternity."

CASSAVA, MANDIOL, or MANIOL (Neo-Lat., Fr. *cassave*, Sp. *casabe*, *casabe*, from Haitian *kasabi*), *Manihot utilisima*. A large, shrubby plant belonging to the order Euphorbiaceæ. Cassava is the West Indian name and is used in the United States; manioc, or mandioc, the Brazilian; and in Peru and other parts of South America, it is called juca, or yuca. It is a native of tropical America, commonly grown in equatorial South America, in Central America, and the West Indies. Cassava is now also extensively grown in Africa and has been introduced into other tropical countries. In the United States it is cultivated in Florida. The plant grows in a bushy form, usually 6 to 8 feet high, and with a spread of about the same dimensions. Cassava grows best on light, sandy, dry soils. It is propagated by cuttings from the stems and branches, which are dropped into furrows and covered. The crop matures in about seven months. The roots, usually from 1 to 3 inches thick and from 1 to 3 feet long, are harvested by hand. See Plate of **CARNATIONS**.

Two varieties of cassava are recognized, the poisonous and the nonpoisonous, or sweet. The poisonous principle is hydrocyanic acid, which is contained in the juice of the plant. Both varieties yield a wholesome food, the volatile poison being driven off by heat in the process of preparation. In South America a sauce (see *CASABEEF*) and an intoxicating beverage are prepared from the juice, while the root, grated, dried on hot metal plates, and powdered, forms the food commonly known there as *farinha* (Portuguese for meal). It is made into thin cakes by the action of heat, which softens and agglutinates the particles of starch. The starch of cassava separated in the ordinary manner from the fibre is the Brazilian arrowroot of commerce. This starch, dried quickly under the action of intense heat when in a semisolid and moist condition, agglomerates into small irregular masses and then forms the well-known article of food called *tapioca*. Sago, or pearl tapioca, is a fine-grained form of the product. In Florida, where sweet cassava is grown, the roots are grated and used directly as a food for man. They are also fed to stock, and serve as a raw material in the manufacture of starch and glucose.

Feeding Value. The peeled root of fresh Florida-grown cassava contains, on an average, 61.3 per cent of water, 31.0 per cent of carbohydrates, largely starch, and a little protein, fat, and crude fibre. Cassava flour, made in Florida, contains about 11 per cent of water and 65 to 70 per cent of starch, in addition to small amounts of protein, fat, crude fibre, sugar, gum, ash, etc. Cassava starch, like other starch, contains some moisture. Cassava is fed to hogs and steers and sometimes to cows. Consult *United States Department of Agriculture, Bureau of Chemistry, Bulletins* 44 (1894), 106 (1907), and *Farmers' Bulletin* 167 (1903).

CASSAY'. See *MANIPUR*.

CASSEL, kās'sel. Until 1866 the capital of the former Electorate of Hesse, now the capital of the Prussian Province of Hesse-Nassau, situated on both sides of the Fulda, here navigable, in lat. 51° 19' N. and long. 9° 20' E., about 35 miles southwest of Göttingen (Map: Prussia, C 3).

The town consists of the Altstadt, the Oberneustadt, and the new Hohenzollern quarter, all on the left bank of the river, and of the Unterneustadt on the right bank. The streets of the old town are crooked and narrow, but those of the newer portion are regular and broad and among the handsomest in Germany. The principal street is the Königsstrasse, the upper and lower sections of which are separated by the circular Königsplatz, remarkable for its echo. On the Friedrichsplatz, the largest square in Germany, are the old Electoral Palace, erected in 1769 and enlarged in 1821, and the Museum Fridericianum, built in 1769 by Landgrave Frederick II. In the same building is the provincial library of 235,000 volumes and 1600 manuscripts, including the Hildebrandslied dating from the eighth century. The brothers Grimm were librarians here from 1814 to 1830. The Murhard Public Library contains (1913) 155,000 volumes. One of the handsomest buildings in the town is the Picture Gallery, of red sandstone, finished in 1877. It contains a fine collection of paintings accumulated by Landgrave William VIII. The Flemish and Dutch schools are particularly well represented, there being some fine paintings by Van Dyck, Rem-

brandt, and Hals. Among the other notable buildings are St. Martin's Church, the post office, and the Court Theatre, of which Louis Spohr was for some years conductor. Cassel is the seat of the provincial and district government and of the supreme provincial court. The town's affairs are administered by a municipal council of 48 and an executive board of 21 members. There is a paid as well as a volunteer fire department. The cost of keeping the streets clean is borne by the property owners. There is a modern sewerage system and a copious water supply, and the town owns and operates gas works, an electric light plant, and a slaughterhouse.

There are numerous educational institutions, including two gymnasia, three municipal high schools, and a score of technical schools. There are many hospitals and other charitable institutions. The industries include the manufacture of locomotives, machinery, ironware, surgical and other scientific instruments, etc. Cassel has excellent railway facilities, and two electric street-railway lines serve to accommodate the city traffic. It is the seat of a United States consulate. Pop., 1900, 106,000; 1910, 153,078. To the west of Cassel and connected with it by steam tramway lies the palace of Wilhelmshöhe, erected in the latter part of the eighteenth century, in which Napoleon III was detained as a prisoner from the fall of Sedan to the close of the Franco-Prussian War. The history of the town dates from the year 913, when, under the name of Chassala, it was the residence of King Conrad I. It received its first municipal rights in the thirteenth century from the landgraves of Thuringia. In the Seven Years' War it was several times captured by the French. Landgrave Frederick II sent 12,000 Hessians to aid the British in the American Revolution and was paid \$22,000,000. In 1807 Cassel was made the capital of the newly formed Kingdom of Westphalia. In 1866 it was occupied by Prussian troops and became a part of Prussia.

CASSEL, DAVID (1818-93). A German scholar. He was born in Glogau, of Jewish parentage, and was educated in Breslau and Berlin. From 1846 until the time of his death he was associated with several of the leading Jewish institutions of learning in Berlin. He was a prolific and popular author and published the following valuable contributions to Jewish literature: *Geschichte der jüdischen Litteratur* (2 vols., 1872-73); *Hebräisch-deutsches Wörterbuch* (1891); *Leitfaden für den Unterricht in der jüdischen Geschichte und Litteratur* (9th ed., 1895). His editions of the *Kusari* by Jehuda Halleli and of the *Meor Enajim* by Rossi are also highly esteemed.

CASELL, JOHN (1817-65). An English publisher, born in Manchester, the son of an innkeeper. As a temperance lecturer he wandered to London, where he established himself as a dealer in tea, coffee, and patent medicines. In 1850 he began to act as publisher of his books, written to diffuse knowledge among the working classes. After carrying through many schemes he founded the publishing house of Cassell, Petter, and Galpin (1859).

CASSENA. See *YAPON*.

CASSIA, kash'ā (Lat., from Gk. *κασσία*, *kaōsia*, *kassia*, *kasia*, cassia, from Heb. *qetsi'ōth*, *cassia*, from *quatsā*, to cut). A name given by the ancients to a kind of fragrant medicinal bark. Cassia is also the botanical name of a genus of

plants of the family Leguminosæ, containing many species, more than 400 having been described as trees, shrubs, and herbaceous plants, natives of Africa and of the warm parts of Asia and America. They have abruptly pinnate leaves, and flowers with deciduous calyx of five somewhat unequal sepals and corolla of five petals. The leaves and pods of many species have a peculiar sweetish but nauseous smell, and a nauseous, bitter taste. They contain a purgative principle, and the leaves of some of the Asiatic and African species are highly valued and are much used as a medicine under the name of senna, the species *Cassia acutifolia* and *Cassia angustifolia* supplying the Alexandria and Tinnevely senna of commerce. The pods of these species are also used and are milder than the leaves. The leaves of *Cassia marylandica* possess similar properties and are now used to some extent in the United States. *Cassia fistula* also yields the cassia pods, pipe cassia, or purging cassia, of the shops. It is a large tree, a native of Egypt and other parts of Africa, perhaps also of the East Indies, where it is widely diffused and cultivated, as well as in the West Indies and in the warm parts of America. Its pods, which have obtained for it the name of pudding-pipe tree, are sometimes 2 feet in length, cylindrical, black, consisting of thin, brittle woody valves, within which is a cavity divided by numerous thin transverse partitions, each cell containing a single seed embedded in a soft black pulp. It is this pulp that is the part used in medicine; it has a sweetish mucilaginous taste and in small doses acts as a mild laxative. It is sometimes removed from the pods when fresh, or an extract is obtained after they are dried, by boiling and evaporating. It is said to contain 61 to 69 per cent of sugar. The cassia pods of the West Indies contain much more pulp and are therefore more valuable than those imported from the East. Cassia bark, or cassia wood, sometimes called China cinnamon, is a bark very similar to cinnamon (q.v.). Cassia buds are believed to be the dried flower buds of the same tree which yields cassia bark. They are now imported into the United States in large quantities and are much used in confectionery. In flavor and other qualities they resemble cassia bark; in appearance they are very similar to cloves. See Plate of CARNATIONS.

CASSIAN GENS. A famous Roman clan, at first patrician, later plebeian. But one patrician member of the gens is mentioned, Spurius Cassius Viscellinus. Under the Republic the family names are Hemina, Longinus, Parmensis, Ravilla, Sabaco, Varus, and Viscellinus.

CASSIANUS, JOHANNES, also called Johannes Massiliensis, or Johannes Eremita (c.360–c.435). A monk who brought Eastern monasticism into the Western church. He was born probably in Provence. He received a good education, went on a pilgrimage to the Holy Land, and became a monk at Bethlehem; then removed to Egypt and lived there as an anchorite from 385 to 400. In the latter year he went to Constantinople and there was made a deacon by Chrysostom. After the exile of the latter he went to Rome to lay the case before the Bishop, Innocent I (405), and lived in Rome for some years. He next is found in Marseilles (415), where he established a monastery and a convent, and there died. His monastery was afterward known as that of St. Victor, of which the present church of St. Victor is

the relic. It served as a model to a multitude of monastic institutions in Gaul and Spain. He also employed his pen in the promotion of monasticism, and his great work, which dates from 420 and which has been strongly influential, is *The Institutes of the Cænobia, and the Remedies for the Eight Principal Faults*, in 12 books, four on the monastic rule and eight on the sins against which the monks had to contend—gluttony, incontinence, covetousness, anger, dejection, distress of heart, vainglory, pride. His second chief work is his 24 *Conferences* with various eminent monks upon monastic interests and the vexed questions of theology. It is the supplement to the *Institutes*.

Cassianus took part in two doctrinal controversies. He wrote *The Incarnation of the Lord*, against Nestorius, and in it pointed out the connection between Nestorianism and Pelagianism. Deeming that St. Augustine had gone too far in his theory of irresistible grace, he utilized one of his *Conferences* to set forth his view that the grace of God always coöperates with our will for its advantage. This view certainly was an approach to that of Pelagius and later was called Semi-Pelagianism. (See PELAGIANISM.) As it gained support from the Massilian monks, St. Augustine, having been informed of it by his friend, Prosper of Aquitaine, wrote strongly against it in his treatises *The Predestination of the Saints* and *The Gift of Perseverance*. The distinction has been thus wittily expressed: St. Augustine regards the natural man as dead, Pelagius as sound and well, and Cassianus as sick.

Cassianus' works, which are all in Latin, appeared for the first time in satisfactory form edited by M. Petschenig (2 vols., Vienna, 1886–88), and in Eng. trans. by E. C. S. Gibson, in vol. xi of the *Nicene and Post-Nicene Fathers* (2d series, London and New York, 1884). For the life and teaching of Cassianus, see the prolegomena of the editions named, and also Lombard (Strassburg, 1863).

CASSIAN WAY. A Roman military road from Rome to Arretium, Florence, and Lucca, built after 187 B.C.

CASSIMERE (Fr. *casimir*, ultimately derived from Skt. *Kāsmīra*, Kashmir). A thin twilled cloth, plain or figured, of wool, or wool and cotton, much used in the manufacture of clothing. It was formerly known as *kersey* (q.v.) or *kerseymere*, a corruption of *casimere*.

CASSIN, JOHN (1813–69). An American ornithologist, born near Chester, Pa. He was familiar with the birds of the Old World, as well as those of America. He wrote *Mammalogy and Ornithology of the Wilkes Exploring Expedition* (1858). He was ornithologist of Perry's expedition to Japan, and with Professor Baird and George N. Lawrence published a "Monograph of Birds of North America North of Texas," in *United States War Department Pacific Railroad Reports*, vol. ix (Washington, 1858); *The Birds of North America* (1860); *Illustrations of the Birds of California, Texas, Oregon, British and Russian America, 1853–55* (1862).

CASSINI, KAS-SÉ-NÉ, ARTHUR PAVLOVITCH (1835–). A Russian diplomat. He entered the Department of Foreign Affairs in 1855. After holding various European posts he became, in 1891, Minister at Peking, where he represented Russian interests with aggressiveness and success during the critical period covering the war

between China and Japan. In 1897 he was made Minister at Washington, becoming later the first Russian Ambassador to the United States. In face of the general anti-Russian sentiment in this country aroused by the Jewish massacres at Kishinev in 1903 and the events of the war with Japan, he conducted himself with great adroitness. In 1905 he was transferred to Madrid and was Russia's representative at the Algeciras Conference in 1906.

CASSINI, kà'sé'né', CÉSAR FRANÇOIS, DE THURY (1714-84). A French astronomer, son of Jacques Cassini. He succeeded his father as director of the Paris Observatory. In 1744 he began the great topographical map of France, which was later completed by his son. Among his published works on geodesy may be mentioned *Description géométrique de la terre* (1775) and *Description géométrique de la France* (1784).

CASSINI, kà-sé'né', GIOVANNI DOMENICO (1625-1712). An Italian-French astronomer, born at Perinaldo, near Nice. He was professor of astronomy at Bologna, and first of the family which for four generations filled the post of director of the observatory in Paris. He determined the motions of Jupiter's satellites from observations of their eclipses and constructed tables of the latter: discovered (1671-84) four of Saturn's satellites and determined their periods of revolution, and determined (1664-67) the rotations of Jupiter, Venus, and Mars. To him is attributed the first systematic observation of the zodiacal light. Cassini made a close approximation ($10''$) to the parallax of the sun, computed a table of refractions, gave a complete theory of the moon's libration, and gave as the obliquity of the ecliptic $23^\circ 28' 42''$, instead of $23\frac{1}{2}^\circ$, and the eccentricity of the earth's orbit as 0.017, instead of Kepler's value, 0.018. In pure mathematics he discovered the curve known as the Cassinian oval (q.v.).

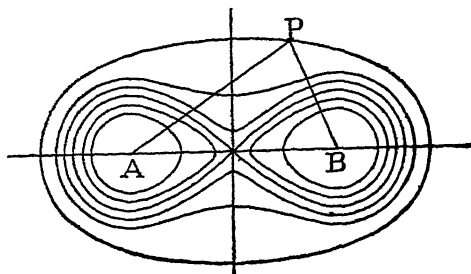
CASSINI, kà'sé'né', JACQUES (1677-1756). A French astronomer, son of Giovanni Domenico Cassini. He was born in Paris and succeeded his father as director of the observatory in 1712. He wrote several treatises on physical subjects, and in his *De la grandeur et de la figure de la terre* (1720) attempted to show that the earth must be a spheroid elongated at the poles. He traveled extensively in Europe, making the acquaintance of the leading scientific men of the time. He was admitted to the membership of the French Académie des Sciences at the age of 17, and two years later was elected fellow of the Royal Society of London.

CASSINI, JACQUES DOMINIQUE, COUNT DE (1748-1845). A French astronomer, son of César François Cassini, whom he succeeded as director of the Paris Observatory in 1784. He was the fourth Cassini in succession to fill this post, the connection of the family with the observatory thus lasting over the long period of 122 years. In 1789 he completed the great topographical map of France begun by his father. He incurred the ill will of the National Assembly and resigned his post in 1793. In the following year he was imprisoned, but regained his liberty after seven months, retiring to his country seat at Thury, where he spent the remainder of his life.

CASSINI'AN OVAL. A bicircular quartic curve, the locus of a moving point the product of whose distances from two fixed points is constant. Its Cartesian equation is

$(x^2 + y^2 + a^2)^2 - 4a^2x^2 = m^4$, where $2a = AB$. The polar equation is $r^4 - 2a^2r^2\cos 2\theta + a^4 = m^4$.

The curve is symmetric with respect to both coördinate axes. If $m < a$, the real curve consists of two ovals; if $m = a$, it becomes the lem-



CASSINI'AN OVAL.

niscate; if $m > a$, it consists of a single oval. Cassinians are curves of the eighth class, except the lemniscate, which is of the sixth. In the case of two ovals, the curve is its own inverse

with respect to a circle of radius $\sqrt{a^2 - m^2}$. The curves are fully discussed in Briot et Bouquet, *Géométrie analytique* (4th ed., Paris, 1890; Amer. ed., Chicago, 1896). For biography, consult Brocard, *Notes de bibliographie des courbes géométriques* (Bar-le-Duc, 1897). See CASSINI, G. D.; LEMNISCATE.

CASSINO, kàs-sé'nó. A city in the Province of Caserta, south Italy, called San Germano until 1871, on the Rapido, 85 miles southeast of Rome (Map: Italy, H 6). San Germano was a frequent residence of popes and emperors, and in 1230 Gregory IX and Frederick II concluded peace here. On March 16, 1815, Murat was defeated here by the Austrians. Half a mile to the south are the ruins of an amphitheatre erected by Ummidia Quadratilla, a Roman lady mentioned by Pliny in his letters (vii, 24). Farther on is the site of the villa of M. Terentius Varro, where Cicero (Phil. ii, 40) says Antony led a riotous life. On a hill above the city is the famous monastery of Monte Cassino (q.v.). Pop., 1881, 12,000; 1901, 13,473; 1911, 14,220.

CASSINO. A game at cards played by two, three, or four persons. Four cards are dealt, two at a time, to each player, and four are turned face up on the table in the same manner. After the hands are played, the greatest number of cards counts the holder three, the greatest number of spades one, big casino (the ten of diamonds) two, little casino (the deuce of spades) one, and each ace one, so that 11 can be possibly counted by one person; the whole game is 21. In cutting and in play the ace is low and counts one; the other cards rank upward in their usual value, the king being high. The play is to take from the table as many cards as possible, preferring spades, or aces, or big or little casino. The tricks are taken by pairing, i.e., by matching one card in the hand with another on the table; thus, a ten will take a ten, or a nine and an ace, or four aces and a six, or any other combination of spots that makes just 10. In "combining" the player may use any card in his hand—except a king, queen, or jack—to take two or more cards whose sum equals his card in value. Another part of the game is "building" cards on the board with one in hand: e.g., a player puts a four on a

six to make up 10, meaning to take both when his turn to play again comes; but any one having a ten may take them before him; or if he builds a six, the next player may make it a nine, and the next still may put on an ace and call it 10, but in building, the one who makes any particular number must hold the card that will take it. Some persons make a progressive build, i.e., if one has a nine and cannot at the time make a nine, he puts a four on a two and calls it six, having of course a three to make a nine when it is next his turn to play. But this kind of building is generally ruled out as irregular. A "sweep" (which counts one) is made when a player takes all of the cards with one card. In a modern variation of the game, the knave counts 11, the queen 12, the king 13, the ace 1 or 14, as the players may choose, and the "joker" 15. This plan greatly enlarges the number of combinations; as, e.g., an ace may possibly take three other aces, four deuces, and a tray, making 14 spots; or the ace may take the big and little casino and two aces, which would make six points in the game. Consult *Foster's Complete Hoyle* (New York, 1909).

CASSIO, kăsh'î-ô, MICHAEL. The successor of Iago to the position of lieutenant of Othello, in Shakespeare's tragedy of the latter name. He is a weak-minded but reputable soldier, whose love of wine enables his enraged predecessor to direct against him the jealousy of Othello. He is finally stabbed by Iago.

CASSIODORUS, FLAVIUS MAGNUS AURELIUS (c.490-c.580). A Latin statesman and writer, the most profound and enlightened scholar of his age. He was born at Scylaceum (Squillace), in Bruttii (now Calabria), of a noble family long settled in that region. First raised to position under Odoacer, he held many important offices under Theodoric the Ostrogoth. From the quaestorship he passed to the consulship in 514; during the following years, though engaged in public services, he devoted his leisure to literary work and study. At the command of Theodoric he prepared a *History of the Goths*, which has survived only in the epitome made by Jordanis. After the death of Theodoric, Cassiodorus published a collection of valuable historical state papers, under the title *Variarum Epistolarum Libri XII*, the most important of his many writings, which gives the best information we possess regarding the Ostrogothic rule in Italy. Consult Hodgkin, *Letters of Cassiodorus* (London, 1886). About 540 Cassiodorus retired from public life and founded upon his estates at Vivarium, near Squillace, a monastery, in which he spent the remainder of his long life in study and pious endeavor. He required of his monks not only meditation, but also scholarship, and this included, as part of their monastic duty, the copying of manuscripts. To the happy example thus instituted we owe the preservation of most of the classic literature. His works are published by Migne in the *Patrologia Latina* (1865), vol. lxxix. Consult Sandys, *A History of Classical Scholarship*, vol. i, especially pp. 258-270 (Cambridge, 1906).

CASSIOPEIA (Gk. Κασσιόπεια, *Kassiopeia*, Κασσιόπεια, *Kassiopeia*). 1. An Ethiopian queen, mother of Andromeda. 2. A constellation in the Northern Hemisphere, near Cepheus, and not far from the North Pole. It is distinguished by a group of six stars of the second, third, and fourth magnitudes, arranged so as to form a somewhat straggling letter W. It was in this

constellation that the famous "new star" of Tycho Brahe blazed out in November, 1572. This star is one of the most remarkable in astronomical annals. The brilliancy of its light, surpassing that of the large planets, and the suddenness with which it was extinguished, bear eloquent testimony to the extreme power of cosmic forces. Tycho's star retained its maximum brightness about 10 days only. Sixteen months elapsed before it finally disappeared from view. Tycho's records, made before the invention of the telescope, do not fix his star's place on the sky with great precision, but it has been identified with a reddish star of the eleventh magnitude which is situated very near the place indicated by him.

CASSIQUIARE, kăs'sê-kyâ'râ, or **CASSIQUIARI**, -rê. A river of Amazonas Territory, Venezuela, which leaves the Orinoco in lat. 3° 10' N., long. 66° 20' W., taking from it one-third of its water, and, after a rapid southwest course of about 250 miles, joins the river Guainia, a branch of the Río Negro, in lat. 2° 5' N., long. 67° 40' W. About 300 yards in breadth when it issues from the Orinoco, it gradually increases until at its union with the Río Negro it attains a width of 600 yards. By the means of this singular river, water communication is established between the systems of the Amazon and the Orinoco.

CASSIRER, kăs'sê-râr', ERNST (1874-). A German philosopher, born at Breslau. He was educated at the universities of Berlin, Leipzig, Munich, Heidelberg, and Marburg, and became lecturer in philosophy in the University of Berlin. His works include: *Descartes Kritik der mathematischen und naturwissenschaftlichen Erkenntnis* (1899); *Leibnitz System in seinen wissenschaftlichen Grundlagen* (1902); *Das Erkenntnisproblem in der Philosophie und Wissenschaft der neueren Zeit* (2 vols., 1906-07; 2d ed., 1911); *Substanzbegriff und Funktionsbegriff* (1910).

CASSITERIDES, kăs'sî-têr'î-dêz. See **SCILLY ISLANDS**.

CASSITERITE (Lat. *cassiterum*, Gk. *κασίτερος*, *kassiteros*, tin, of unknown origin, borrowed in O. Church Slav. *kositerŭ*, Skt. *kasītra*, Ar. *qazdir*, tin). A tin dioxide that crystallizes in the tetragonal system. It occurs both massive and in the form of crystals, usually of a black or brown color, although sometimes red or yellow. Cassiterite is found in Cornwall, England (formerly in large quantities); in Bohemia and Saxony, on the Malay Peninsula, in Banca, Australia, and in Mexico. In the United States it is reported from Maine, Virginia, South Dakota, and California. It is an important ore of tin, as, when pure, it contains nearly 79 per cent of that metal. The ordinary massive cassiterite is called *tin stone*; when found in botryoidal or reniform shapes it is known as *wood tin*, and when in the state of pebbles or sand along the beds of streams it is called *stream tin*.

CASSIUS, kăsh'ŭs, AVIDIUS. A Roman general under Marcus Aurelius, from Cyrrhus, in Syria. He won much renown by victories over the Parthians (162-165 A.D.). Subsequently he quelled a dangerous insurrection in Egypt and was appointed governor of all the Eastern Provinces. He organized a revolt and attempted to seize the Imperial throne, but was assassinated by two of his own officers (175).

CASSIUS, DIO. See **DIO CASSIUS**.

CASSIUS, PURPLE OF. A dark-purple, red, or reddish-brown pigment. It was discovered by Andreas Cassius in the seventeenth century and may be obtained as a fine flocculent purple precipitate on adding a solution of stannous chloride containing stannic chloride to a solution of gold chloride. It may also be obtained by treating an alloy of gold (2 parts), tin (3.5 parts), and silver (15 parts) with nitric acid, which removes the silver and oxidizes the tin. The composition of purple of Cassius is variable, but it is believed that gold is present in it in the metallic state. Mixed with borax or some fusible glass, it is used by potters to produce a rich purple or rose tint in the finer qualities of pottery, and it has long been employed to give a ruby-red color to the better qualities of glass.

CASSIUS LONGINUS, GAIUS. 1. One of Cæsar's assassins. Though a tribune of the plebs, he sided with Pompeius and the aristocratic faction against Cæsar. He was taken prisoner by the latter, who pardoned him, and even made him one of his *legati*. In 44 B.C., through the influence of Cæsar, he was made *prætor peregrinus* and was promised the governorship of Syria for 43. Becoming incensed at Cæsar, because Cæsar appointed a younger man, M. Junius Brutus, *prætor urbanus*, he soon matured the conspiracy, and Cæsar fell by the daggers of assassins. Since popular feeling—as displayed by the riots that broke out at Cæsar's funeral—was strongly against the murderers, and the military power fell into the hands of Marcus Antonius, Cassius fled to the East and made himself master of Syria. Afterward he joined forces with Brutus. (See **BRUTUS, MARCUS JUNIUS**.) Cassius's wife, a half sister of Brutus, survived him upward of 60 years (to 22 A.D.).

2. A Roman jurist (c.3-75 A.D.), consul in 30, proconsul of Asia, 40-41, and governor of Syria in 45-50. He was banished to Sardinia in 65, because he revered the memory of the Cassius who had helped to slay Cæsar, but was recalled by Vespasian. He wrote *Libri Iuris Civilis*, in 10 books, which was one of the sources of the Digest of Justinian (q.v.).

CASSIUS LONGINUS, QUINTUS, brother or cousin of the Cassius who helped to kill Cæsar. He was *quæstor* in Spain in 54 B.C. In the critical year 49, as tribune of the people, he warmly supported Cæsar and was rewarded with the governorship of Hispania Ulterior. His tyrannical rule caused a rebellion, which he put down without mercy. When his own troops revolted, he was besieged in Ulia, a town of Hispania Bætica. Through the influence of Marcus Lepidus, the triumvir, he was allowed to go free. He sought to sail from Malaca, but perished in a storm near the mouth of the Ebro (43 or 47 B.C.).

CASSIUS PARMENIS, or GAIUS CASSIUS SEVERUS. One of the conspirators against Julius Cæsar. He was an adherent of Gaius Cassius Longinus and fought with him at Philippi. Afterward he joined Sextus Pompeius and finally supported Antonius until the defeat at Actium. He went to Athens, but was arrested and executed, about 30 B.C., by order of Augustus. He wrote satires, elegies, epigrams, and tragedies.

CASSIUS VISCELLINUS, SPURIUS. A Roman, thrice consul—in 502, 493, and 486 B.C. Despite the strong opposition of the patricians,

led by his fellow consul, Virginius Tricostus, he effected, in 486, the passage of the first agrarian law, which was, however, never enforced. See **AGRARIAN LAW**.

CASSIVELLAUNUS (c.50 B.C.). A native chieftain chosen by the Britons to be their commander when Cæsar made his second invasion, in 54 B.C. Cassivellaunus was routed in the first engagement, but continued to harass the Romans and to cut off all foragers or stragglers. Moved by reverses, he finally gave hostages to Cæsar, who commanded him also to pay a tribute and not to make war on the tribes who had aided the Romans. Consult Cæsar, *Gallie War*, bk. v.

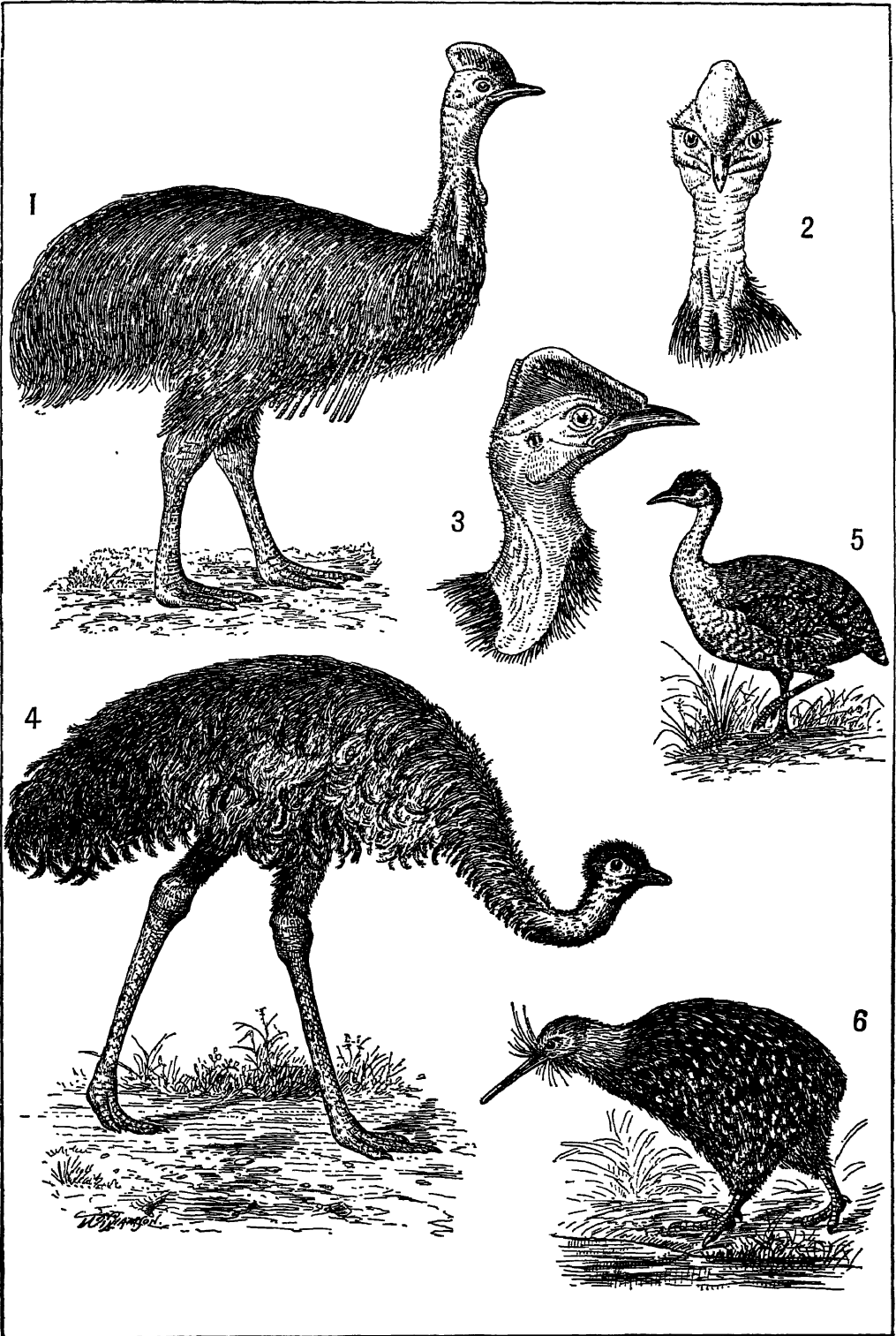
CASSOCK. See **COSTUME, ECCLESIASTICAL**.

CASSOPOLIS. A village and the county seat of Cass Co., Mich., 90 miles west by south of Jackson, on the Michigan Central and the Chicago and Grand Trunk railroads. It is known as a summer resort, being in a picturesque lake region, and contains a public library, museum, and fine courthouse. The industrial establishments include flour and saw mills and a telephone-supply factory, etc. Pop., 1890, 1369; 1900, 1330; 1910, 1358.

CASSOWARY (Fr. *casoar*, Sp. *casoario*, *casobar*, Dutch *casuar*, from Malay *kassuaris*). A family (Casuariidæ) with the single genus *Casuarius* of ratite, or palæognathous, birds allied to the ostrich, but distinctively characterized by still greater shortness of wing, by a bony crest, by pendent wattles on the naked neck, and by three toes on each foot, the inner toe short and armed with a very long and sharp claw. There are also very important anatomical differences (see Huxley, *Proceedings Zoological Society of London*, 1867), especially in its digestive organs, which are not adapted to the same coarse diet. Cassowaries are still more closely allied to the emus, and with them form a group (Megastanes) peculiar to the Australian region and the Papuan subregion, including New Guinea, Salwatty, New Britain, the Aru Islands, northern Queensland, and Ceram. About 20 forms of cassowary are known, of which the most familiar is that from Ceram (*Casuarius casuaris*, or *galeatus*), known since 1596 and frequently seen in zoological gardens. It is the largest known bird except the ostrich, and its height, when erect, is about 5 feet. The color is brownish black. The feathers are loosely webbed and hang down, so that at a little distance the bird seems clothed with hair. Those of the rump are 14 inches long, hanging down in place of a tail. The aftershaft is as long as the feather proper. The plumage of the chick is striped, of the immature brown, while the feathers are black in the adult. The head and upper part of the neck are naked and of a bluish color, and there are two pendent wattles, partly red and partly blue, on the front of the neck. On the breast is a callous bare part, on which the bird rests its body on the ground. The bony crest or helmet reaches from the base of the bill to the middle of the crown and is about 3 inches high, exhibiting the most intense blue, purple, and scarlet, blended together. When attacked, it defends itself by kicking forward and downward and also obliquely backward with its stout naked legs and feet. There are only about five quills in each wing, somewhat resembling the quills of a porcupine, and at the end of the last joint of the wing there is a spur.

The cassowary lays six to eight eggs, which

CASSOWARIES, ETC.



1. COMMON CASSOWARY (*Casuarius casuarius*).
 2. BECCARI'S CASSOWARY (*Casuarius beccarii*).
 3. MILNE-EDWARD'S CASSOWARY (*Casuarius edwardsi*).

4. EMEU (*Dromæus novæ-hollandiæ*).
 5. GREAT TINAMOU (*Rhynchotes rufescens*).
 6. OWEN'S KIWĪ (*Apteryx oweni*).

are rough, greenish, and are incubated by the cock. The cassowary is becoming more rare in its native regions, in which it is sometimes kept tame. Not much is known of the habits of any of these birds, which dwell in deep forests and feed on fruit and vegetables. They are diurnal, sleeping throughout the night. The voice differs in the various species, being a curious, moderately loud grunting, bellowing, and snorting. Their temper is treacherous in captivity, although occasionally a bird will permit familiarity. They are frequently tamed by the natives and but seldom breed in confinement. Their skin and feathers are widely used as clothing and ornament; their bones point spears; and their flesh, though tough and dark, is eaten. The fullest earlier account of the genus is that by Salvadori, in his great Italian work on the ornithology of the Papuan region; see Rothschild, "A Monograph of the Genus *Casuarus*" (*Trans. Zool. Soc. London*, xv, 1901). One species, having an excessively large helmet (*Casuarus australis*), occurs in northern Australia. Another (*Casuarus bennetti*), peculiar to New Britain, is known as "moorup" (not "mooruk," as usually spelled). See Plate of CASSOWARIES, ETC.

CASSOWARY TREE. See CASUARINA.

CAS'SUMU'NAR. See GINGER.

CAST (Icel., Swed. *kasta*, Dan. *kaste*, to throw). A work of art produced by a mold. The work is first modeled by hand, then covered with plaster so applied that it may be removed in sections when dry, thus forming a kind of shell to the sculptured form beneath. These sections are put together and form the mold, which is filled with liquid plaster, the interior of the shell being so lubricated as to prevent the plaster from adhering to the casing. When this interior plaster is hardened, the case is again removed, and the reproduction of the original appears. The first mold is made over the modeled clay figure or group of figures fresh from the sculptor's hand. As the clay is perishable, it is necessary to imitate the original, and from the plaster, which is more durable, a number of replicas may be made. Even though the mold should be broken, another can now be taken from one of the plaster figures. Many of the masterpieces of antiquity are thus repeated, and they supply museums and schools of art as models for study. When a figure or group is cast in bronze, it is more properly called founding. (See BRONZE, *Casting*.) Casting has been in use from early times, and was employed by the ancients for multiplying their statues.

CASTAGNO, kās-tā'nyō, ANDREA DEL (c.1410-57). A Florentine painter of the Renaissance. He was born at Castagno, in the Mugello district, near Florence, the son of a peasant. His ability attracted the attention of Bernadetto de' Medici, who placed him with a competent teacher in Florence, probably with Paolo Uccello, by whom he was certainly influenced. He was deeply affected by the sculptures of Donatello. His few surviving works reveal him as the most gifted and influential of the realists who followed Masaccio. His drawing is bold and firm, his color bright and crude, and the impression gained from his works is one of rugged strength and power. On the return of Cosimo de' Medici from exile in 1434, Castagno was commissioned to paint on the walls of the Palazzo del Podestà his banished adversaries, hanging by their feet, whence his nickname Andreino degli Impiccati ('the hanged men'). His principal works are

the frescoes of Sant' Apollonia: the "Last Supper" (a masterpiece), "Crucifixion," "Entombment," and "Resurrection." Here also are the nine more than life-size figures, formerly in the Villa Carducci at Legnara, including Dante, Petrarca, Boccaccio, the powerful Farinata degli Uberti, and the swaggering Pippo Spano. Other important works, likewise frescoes, are the equestrian portrait of Nicolo da Tolentino (1456) in the cathedral, a pendent of Uccello, a masterpiece; and a "Crucifixion" in Santa Maria Novella, painted with characteristic and brutal realism. The story, told by Vasari, that he murdered Domenico Veneziano to steal his secret of oil painting has long been proved a myth by the fact that his associate survived him several years. Castagno died in Florence, Aug. 19, 1457. Consult the monograph of Waldschmidt (Berlin, 1900).

CASTAGNOLE. See POMFRET.

CASTAIGNE, kās'tān', ANDRÉ (1861-). A French painter and illustrator. He was born at Angoulême and studied in Paris, principally at the Beaux-Arts with Gérôme and Cabanel. Among his notable pictures are "After the Combat" (1899; Peabody Gallery, Baltimore), "Alexander at the Temple of Memphis" (1900). He works with facility in oils, water colors, charcoal, and pen and ink, but his reputation rests principally upon his exceedingly clever illustrations, many of them dealing with Western subjects, such as Texas cowboy life. From 1890 to 1894 he was instructor of the Charcoal Club, an art school of Baltimore. Mention should be made of his illustrations of Western subjects, published in the *Century*, and of his illustrations of B. I. Wheeler's *Life of Alexander the Great* (1900). He published *Fata Morgana*, a novel dealing with the art life of Paris and illustrated by himself (1904). His work is characterized by spirited movement and dramatic feeling.

CASTALIA (Lat., Gk. *Kασταλία*, *Kastalia*). A fountain sacred to Apollo and the Muses, on Mount Parnassus, in the cleft between the great cliffs of the Phædridae, near Delphi. It was the "holy water" of the Delphian temple; all who consulted the oracle had to bathe, or at least to wash their hair, in its water. The Roman poets declared that its waters filled the mind of those who drank of it with poetic inspiration. Its waters are still pure and delightful.

CASTALIDES, kās-tāl'ī-dēz. A name given to the Muses, because Castalia (q.v.) was sacred to them.

CASTALIO, kās-tāl'yō, **CASTELLIO**, kās-tāl'yō, or **CASTELLION**, SEBASTIAN (1515-63). A French Protestant theologian, born at Saint-Martin du Fresne, a Savoy village, near Geneva. He received a thorough humanistic training and about 1541 went to Strassburg, where he was befriended by Calvin, who, on his return to Geneva in 1541, appointed him rector of the high school and preacher; but, differing from Calvin on what were considered important points, he was compelled to resign in 1544 and went to Basel, where he lived in great poverty, as he had a large family to support, until in 1552 he was appointed professor of Greek literature. Among his writings may be mentioned *De Hæreticis*, a treatise which argues against the right of the magistrate to punish heretical opinions and which produced a reply from Beza; a Latin version of the Bible, published in 1551, and dedicated to Edward VI of England; and a French translation of the Bible, dedicated to Henry II

of France. See CALVIN. Consult Castalio's *Life*, by Buisson (Paris, 1892).

CASTA'NEA. See CHESTNUT.

CASTANETS (Fr. *castagnette*, from Lat. *castanea*, chestnut, so called from the shape). A musical instrument of percussion, usually in the form of two hollow nutshells, which are tied together by a band fastened on the thumb and struck by the fingers to produce a rattling sound in keeping with the rhythm of the music. The castanets were introduced into Spain by the Moors, where they retain the name of *castañuelas*, from their resemblance to the form of the chestnut. The castanets are now much used in the ballet and in the opera.

CASTAÑOS, ká-stā'nyós, DON FRANCISCO XAVIER DE, DUKE OF BAILÉN (c.1756-1852). A celebrated Spanish general. He was born in Madrid and at the age of 10, as a reward for his father's services, was appointed captain of a company by Charles III. By virtue of a plan made by the same monarch for officers who were minors, he took his studies in El Seminario de Nobles de Madrid. At the age of 16 he was assigned to the Savoy Regiment as captain of Grenadiers, and did good service in the reconquest of Minorca. He served with distinction in the campaign of 1794 against the French. When the French invaded Spain, Castaños received the command of a division of the Spanish army, and on July 22, 1808, compelled 20,000 French under General Dupont to surrender at Bailén. It is asserted, however, by some, that the merit of this success belongs more to Aloys Reding, a Swiss by birth and the second in command. The honors of the fight itself belong in large part to Reding, but the plan for the campaign and for the battle had been made by Castaños. In November of the same year Castaños was in turn defeated by the French at Tudela. Upon the arrival of Wellington he was again placed at the head of the Spanish army, which he led, under Wellington, in the important battles of Albuera, Salamanca, and Vitoria, in the last of which particularly he distinguished himself. In 1815 he was placed at the head of 80,000 troops destined to invade France, some of which had already crossed the frontier when the news came of the battle of Waterloo. Although he was not a favorite with the court politicians, his talents could not be overlooked. In 1825 he was called to the State Council, where he became a decided opponent of the Carlist party. Castaños was made Duke of Bailén in 1833 and in 1843 became the guardian of Queen Isabella. He subsequently returned to his estates, and died at the age of 96.

CASTE, kást. In a general sense, an hereditary division or arrangement of society on the basis of occupation or other arbitrary condition; specifically, a class or grade so established, particularly among the Hindus. The word is not native to India, where the distinctions are best developed and where the term was first applied specifically as well as in its more general sense, but is probably Portuguese (the earliest Occidental colonists in the Deccan and some other portions of India were from Portugal), in which language it denotes family, strain, breed, or race, the Portuguese (and Spanish) form being *casta*, the feminine of *casto* (Latin, *castus*, pure). Among earlier English writers the form was *cast*, used in the sense of aspect or mode (as in "cast of countenance"), or perhaps in the archaic sense of breed, derived from a stock breeder's term still colloquial in England; indeed,

there is some question whether the English term is not prior to the Portuguese. The Sanskrit term is *varṇa*, signifying 'color,' and denoted originally, no doubt, the distinction between the lighter-complexioned Aryan invaders who entered India from the northwest and the dark-skinned or colored aborigines whom they subjugated or drove onward before them. This fact throws considerable light on the origin of the social distinctions so highly developed in India and certain other countries. In any case the Occidental term is synonymous with "chaste" (early French and modern English), and hence connotes purity, continence, freedom from taint, exclusiveness, and in general the attributes of race sense or ethnocentric sentiment.

The four great castes of India—the Brahmans, or Priests, the Warriors, the Husbandmen, and the Serfs—are as old in fact, if not in name, as the ancient sacred collection of hymns known as the Rig-Veda (cf. R.-V. 10, 90, 12; 8, 35, 16-18). The system, however, in its developed form is not sharply defined until the so-called period of Brahmanism. (See INDIA, *Religion*.) The division of an early community into priests, warriors, and agriculturists, or third estate, is a natural one, and is found likewise in ancient Persia. The fourth caste in India came into being when the invading Aryans subjugated the natives and made them captives or slaves. They allowed them to become a part of the body politic, but they denied them all religious rights and privileges which the three Aryan castes enjoyed. Disregarding minor subdivisions, the four Hindu castes, commonly recognized, are as follows:

1. **The Brahman or Sacerdotal Class.** At the head of the elaborated Hindu caste system stands the Brahman, or Brahmin, the priest, in Sanskrit *Brāhmana*, a term synonymous with sanctity and exaltation. The legendary account of Manu (q.v.) says that this class issued from the mouth of the god Brahma at the moment of creation. The business of the Brahmans, through their knowledge of the sacred Vedas, is to perform sacrifices for themselves and others and to give spiritual guidance to the rest of mankind, which has to rely on them for the favor of the gods. The Brahmans are the chief of all created beings, and other mortals enjoy life through them. They are to be treated with the most profound respect, even by kings. The person of a Brahman is sacred; and it is his privilege to enjoy almost all immunities and exemptions. Special rules, on the other hand, are laid down in the priestly codes, by which he shall preserve his sanctity.

2. **The Warrior Class.** This is the Kshatriya, Ksettri, Chuttree, or military class, corresponding especially to the Rajputs of Rajputana in recent times. The name is derived from Sanskrit *kshatra*, signifying 'rule, power,' and the Kshatriyas are said to have sprung from the arms of Brahma. Their duty is to fight and to protect the other classes. The relation between them and the priestly caste is a mutual one. The sacerdotal order cannot prosper without the military, nor the military without the sacerdotal; and the prosperity of both, in this world as well as in the next, is made to depend upon their cordial union. The priests allowed the Kshatriyas the cherished privilege of having the Veda imparted to them. In return the latter granted protection and support to the Brahmans. From necessity a warrior occasionally might assume the calling or duties

of a man of the lower caste, but in only the most exceptional instances is there a record of a soldier or king rising to the dignity of the priestly class.

3. **The Vaisya or Husbandman Class.** The third caste in the Hindu system is known as the Vaisya (later *Bais*, *Bice*) order, which forms the great industrial class of India. The members of this class make up the body of the people (Skt. *vaiśya*, from *viś*, folk), and they were first pastoral, then agricultural, and finally commercial—the third estate of the Aryans. They are described as being sprung from the belly and the thighs of Brahma at the time of creation. As an Aryan, the member of the Vaisya class shared with his warrior brother the privilege of having a knowledge of the Veda and of witnessing the sacrificial rites accorded to the ruling order. Upon his gains, won by industrial pursuits, the warrior largely depended for support. Cattle keeping, agriculture, trade, and business were his duties—in fact, the various branches of practical business life. Though superior to the Sudra or servile class, he was often closer in reality to this order than he was to the two higher castes.

4. **The Sudra or Servile Class.** The fourth or lowest caste of Hindu society is the class of Sudras, Sooder (Skt. *sūdra*)—a name of uncertain origin, but synonymous with “degradation.” Sprung from the feet of Brahma, according to the dictum of Manu, their duty was to serve the three superior classes, especially the Brahmans. Their condition from the earliest time was one of subjection. They were not even allowed to hear the Veda, as that would be a defilement of the sacred text; they never could be invested with the sacred cord which brought regeneration to the other three classes when they were admitted into religion and thus became “twice-born.” As originally non-Aryans or barbarians, they were allowed to come into contact with the upper classes only as menials, whose touch was equivalent to pollution and whose slightest offense was punishable with death. They form to-day the basis of the lower classes of Hindu society, those that perform the most degrading services, but many have been able to rise by degrees to a position of respect, coincidently with a greater growth of laxity in observing caste restrictions.

The subdivisions and mutual relations of these four castes in early days, as in modern times, was quite complex. (See Hopkins, *The Mutual Relations of the Four Castes according to the Mānavadharmasāstram*, 1881; and Jogendra Nath Bhattacharya, *Hindu Castes and Sects*, 1896.) Mixed classes arose through forbidden marriages between the classes, and the utterly vile Pariahs or outcasts arose from their expulsion from the classes into which they were born. The additional castes and subcastes are likewise to be accounted for in various ways.

Regarding the castes as originally ethnic or tribal, and recalling the devices of primitive peoples for maintaining tribal purity, it is of interest to note the provisions of the *Manavadharmasāstram* (or Code of Manu) respecting marriage: (1) “The vow [of studying] the three Vedas under a teacher must be kept for 36 years, or for half that time, or for a quarter, or until the [student] has perfectly learnt them. (2) [A student] who has studied in due order the three Vedas, or two, or even one only, without breaking the [rules of] studentship, shall

enter the order of householders. . . . (4) Having bathed, with the permission of his teacher, and performed according to the rule the *Samavartana* [the rite on returning home], a twice-born man shall marry a woman of equal caste who is endowed with auspicious [bodily] marks.

(5) A [damsel] who is neither a *Sapinda* on the mother's side, nor belongs to the same family on the father's side, is recommended to twice-born men for wedlock and conjugal union.

(6) In connecting himself with a wife, let him carefully avoid the 10 following families, be they ever so great, or rich in kine, horses, sheep, grain, or [other] property (viz.): (7) One which neglects the sacred rites, one in which

no male children [are born], one in which the Veda is not studied, one [the members of] which have thick hair on the body, those which are subject to hemorrhoids, phthisis, weakness of digestion, epilepsy, or white or black leprosy.

(8) Let him not marry a maiden [with] reddish [hair], nor one who is sickly, nor one either with no hair [on the body] or too much, nor one who is garrulous or has red [eyes]. (9) Nor one named after a constellation, a tree, or a river, nor one named after a bird, a snake,

or a slave, nor one whose name inspires terror. (10) Let him wed a female free from bodily defects, who has an agreeable name, the [graceful] gait of a Hamsa or of an elephant, a moderate [quantity of] hair on the body and on the head, small teeth, and soft limbs. . . . (12)

For the first marriage of twice-born men [wives] of equal caste are recommended; but for those who through desire proceed [to marry again] the following females [chosen] according to the [direct] order [of the castes] are most approved. (13) It is declared that a Sudra woman alone [can be] the wife of a Sudra, she and one of his own caste [the wives] of a

Vaisya, those two and one of his own caste [the wives] of a Kshatriya, those three and one of his own caste [the wives] of a Brahmana.”

(“The Laws of Manu,” translated by Bühler, in *The Sacred Books of the East*, ed. by F. Max Müller, vol. xxv, pp. 74-77, 1886.)

There follow various other prohibitive and permissive provisions, with descriptions of the “eight marriage-rites used by the four castes (*varṇa*) which partly secure benefits and partly produce evil both in this life and after death.”

These and other provisions and descriptions illumine the entire subjects of castes and prove that, whatever the origin of the distinctions, they are now primarily ecclesiastical, in somewhat less degree connected with occupation, and only subordinately ethnic (racial or tribal).

True, Halhed (*A Code of Gentoo Laws*, 1776), writing early and with good opportunities for observation, assumed the division to represent tribes, and Risley (*The Tribes and Castes of Bengal*, 1892) more recently correlates caste with physical type, and the ethnic hypothesis seems to find support in the native term con-

noting caste and color; but it is manifest in the first place that the Code of Manu is not directed primarily towards the preservation of distinct race types so much as towards collective preservation of physique and elimination of the supposedly barbaric custom of totemism, etc., and in the second place that no aboriginal distinctions of type could survive the constant blending sanctioned by immemorial laws governing intermarriage. Moreover, the four or five castes commonly recognized represent but a

small part of the classes actually established by Brahmanical law in different parts of India; each province has its own more or less distinct groups defined by craft and fixed by custom, the aggregate reaching many hundreds in number—no less than 2000 according to some students. (See Crooke, *Tribes and Castes of the Northwestern Provinces and Oude*, 1896.) Still further, it is evident that the development of castes is long past its prime; for not only were the caste lines weakened by every foreign invasion from the time of Alexander to that of Warren Hastings, but they were burst from within by ecclesiastical schisms, and most notably by the rise of Buddhism, itself a reaction from, and protest against, the intolerable bondage of the caste system, as shown by Rhys-Davids and, still more recently, by Porter ("Caste in India," *American Anthropologist*, vol. viii, p. 23, 1895). While there is a presumption that the custom of caste was rooted in tribal or racial distinctions, it is inconceivable that such distinctions were ever so numerous and diverse as the arbitrary classes into which Indian society was divided before Buddhism arose.

With reference to caste at the present day in India, it may be added that English rule and (occidental influences have done much to break down the stringency of the caste system of the Hindus. The obligation of the son to follow the calling of his father is no longer so binding as it once was, unless it be in the case of a Brahman, and yet a Brahman may serve to-day as a soldier, and some even have become cooks. Men of lower castes have risen to higher ranks and to positions of power, and loss of caste is not so serious as it may once have been. In most cases it may be recovered and without much ado. With the spread of Christianity, the advance of education, and the extension of the railway system throughout India, the barrier of caste tends to give way, and the difficulties that arise from the old Brahmanical legislation are no longer so exaggerated but that certain points may not be brought out in its favor, whatever may rightly be urged against caste as an institution.

While the system of caste attained its highest development in India in pre-Buddhist times, it was by no means confined to that country and period. The *Avesta* (q.v.) shows for ancient Iran a like division of the community into priest, warrior, and husbandman, *Atharvan*, *Rathesh-tar*, *Vashtya* *Fshuyant*. (See Geiger, *Civilization of the Eastern Iranians*, Eng. trans., 1885.) Indeed, the caste sentiment prevails in greater or less intensity among all peoples. In all monarchial countries there are class distinctions more or less closely analogous to the Hindu castes: in mediæval Europe class sentiment gained a hold the strength of which may be measured by the persistence of the guilds into which it grew on the one hand and the secret orders (Rosicrucians, Freemasons, etc.) on the other; yet here the sentiment was not inculcated by law and literature and seldom crystallized by belief. The most instructive analogues of the Indian castes are found in still lower culture than that of the half-literary Hindus. The Black-fellows of Australia have an elaborate system of social regimentation, maintained by intricate marriage regulations and other ceremonies, all expressing a sort of instinctive law so complete that Caucasians find difficulty in following its ramifications. Various African tribes have so-

cial customs of nearly as great complexity interwoven with crude beliefs. The native tribes of the Western Hemisphere are much given to "medicine societies" and other intratribal organizations of primarily ecclesiastical character which correspond roughly with certain of the Hindu caste distinctions. On the coast of Alaska and British Columbia, as well as in neighboring territory in the interior, distinctions of caste are strongly emphasized among the aboriginal tribes, who distinguish four classes,—chiefs, noblemen, the common people, and slaves. The social classes of China are suggestively similar to those of the neighboring country. It is notable that in the successive culture stages, from that represented by the Australian Blackfellows upward, the laws crystallized by the ceremonial observances grow simpler, more intelligible, and, excepting among the Hindus, where the primitive character is retained in social ordination by caste, more lax, or rather more subservient to current judgment. Accordingly caste may be defined as a primitive device for maintaining social organization by means of ecclesiastical ordinances.

Bibliography. The literature of caste is voluminous. In addition to the works above mentioned, attention may be directed to Senart, *Les castes dans l'Inde* (Paris, 1896); Muir, *Original Sanscrit Texts on the Origin and Progress of the Religion and Institutions of India* (London, 1867-75); and the several standard works referred to in these publications, notably the translations of the Laws of Manu, by Bühler in *The Sacred Books of the East*, vol. xxv (Oxford, 1886), and by Burnell and Hopkins, *The Ordinances of Manu* (London, 1884). It is interesting to compare with the foregoing the point of view of an educated native: Shridhar V. Ketkar, *History of Caste in India* (2 vols., London, 1909, 1911).

CASTE. A sentimental comedy by F. W. Robertson, produced at the Prince of Wales's Theatre on April 6, 1867, and published in London, 1889, in his son's edition of his principal dramatic works. It was originally presented by Marie Wilton (Mrs. Bancroft) and her company. F. C. Robertson, the author's brother, played the part of Captain Hawtree in a later production of the piece, and it was in the repertory of Mr. Hare on his American tour in 1897-98. It is regarded as the author's most successful work.

CASTEGGIO, kās-tēd'jō. See MONTEBELLO.

CASTEL, kās-tēl' (Fr., It. *castello*, Sp. *castillo*, Prov. *castelh*, from Lat. *castellum*, dim. of *castrum*, camp). A name prefixed to various places in Italy, France, Spain, and Portugal.

CASTEL. See CHÂTEAU.

CASTELAR Y RIPOLL, kās'tā-lār' ē rē-pōl', EMILIO (1832-99). A Spanish republican leader, born in Cadiz, Sept. 8, 1832. He was the son of a business man, and at the death of his father was left in poverty, but managed to study at the University of Madrid, first in the faculty of law and later in the faculty of philosophy and letters, where he was received as doctor in 1853. He then worked as a journalist and novelist until in 1854 a daring entrance into the field of political debate secured for him recognition as one of the most brilliant of Spanish orators. In 1856 he became professor of history in the University of Madrid, but lost the place in 1865, in consequence of an attack on the Queen in *La Democracia*, a radical journal. The paper was suppressed in 1866, and Castelar was sentenced to

death for participation in the disturbance of June in that year, but he escaped to Switzerland and subsequently went to France. At the beginning of the revolution of 1868 he returned to Spain and resumed his professorship, and in 1869 was one of the few republicans returned to the Cortes, going as deputy for Saragossa. In that body he advocated the establishment of a republic and vigorously opposed the schemes of a regency. Under the republic proclaimed by the Cortes after the abdication of Amadeus I (q.v.) Castelar was made Minister of Foreign Affairs (Feb. 11, 1873); but he resigned in June. On August 26 he was elected President of the Cortes, and on September 7 the Cortes chose him President of the Executive, investing him with extraordinary powers. His first act was to pro-rogue the Cortes and assume complete authority. He made energetic but ineffectual efforts to suppress the Carlists and sent the Minister of War to Cuba, in person, to protect Spanish interests in that island. When the Cortes reassembled, Jan. 2, 1874, a vote of confidence in Castelar was defeated, and he at once resigned. Thereupon Pavia, as captain general of Madrid, forcibly dissolved the Cortes and appointed a provisional government with Marshal Serrano at its head. Soon after the pronunciamiento in favor of Alfonso XII, in December, 1874, Castelar went to Switzerland, whence in March, 1875, he sent back his resignation of the chair of history in the University of Madrid. Early in 1876 he returned to Spain and was elected to the Cortes, of which he was a member until 1893. During the reign of Alfonso XII, Castelar vigorously defended the reforms of the revolution of 1868, but after the birth of King Alfonso XIII (1886), perceiving that revolutionary methods were ill-suited to Spanish progress, he sought the realization of the revolutionary programme through legal and pacific means. His active opposition to the state had changed to a philosophical republicanism, revolution in politics with him had given place to evolution, and in 1893 he admitted that the monarchy was the only form of government then possible in Spain. In that year, seeing that universal suffrage was firmly reestablished, he gave up politics for literary work. He was always, in fact, more of an orator than a man of action. He died in Murcia, May 25, 1899. Castelar was a prolific writer, like his political rival, Cánovas del Castillo. His published works include *La cuestión del oriente* (1876); *Historia del descubrimiento de America* (1892); *La politique européenne* (Paris, 1897-99); *A History of Civilization in the First Five Centuries of Christianity* (1859); *Historical Essays on the Middle Ages*; *Fra Filippo Lippi* (1877-79); *Life of Lord Byron* (1876); and several volumes of essays, speeches, novels, and travels. Consult: Hannay, *Don Emilio Castelar* (New York, 1896), discriminating and interesting; Madame Rattazzi, *Une époque; Emilio Castelar, sa vie, son œuvre, son rôle historique* (Paris, 1899), eulogistic but valuable chiefly for the extracts from Castelar's own letters; Araco, *Castelar, su vida y su muerte* (Madrid, 1900).

CASTELBUONO, kās'tēl-bwō'nō. A town in the Province of Palermo, Sicily, Italy, 31 miles north of Caltanissetta (Map: Italy, J 10). It has noted mineral springs, and manna is cultivated and exported. Pop., 1901, 10,761; 1911, 10,531.

CASTEL FRANCO DELL' EMILIA, frāp'-kō dēl ā-mē'lē-ā. A city in the Province of

Bologna, Italy, 8 miles northeast of Modena. It occupies the site of the ancient Forum Gallorum, where in 43 B.C. Marc Antony defeated the consul Pansa only to be defeated himself immediately afterward by Pansa's colleague, Hirtius. Important modern industries are match and paper making. Pop. (commune), 1901, 13,500; 1911, 15,300.

CASTEL FRANCO VENETO, vā-nā'tō. A city in the Province of Treviso, north Italy, 34 miles northwest of Venice, pleasantly situated on the Musone. It has an ancient castle, and in the principal church are frescoes by Paolo Veronese (q.v.) and an altarpiece by Giorgione (q.v.). Here the French, under Saint-Cyr, defeated the Austrians under Prince Rohan, Nov. 23, 1805. It is an important silk market. Pop. (commune), 1901, 12,551; 1911, 14,825.

CASTEL GANDOLFO, gān-dōl'fō. A town in the Province of Rome, Italy, on the west shore of Lake Albano, about 13 miles southeast of Rome (Map: Italy, M 2). It contains a papal palace and has been a favorite summer resort of the popes, and by a guaranty of the Italian government, given May 13, 1871, enjoys extra-territorial rights. Pop. (commune), 1901, 2316; 1911, 2245.

CAS'TELL, EDMUND (1606-85). An English Orientalist. He spent 18 years in compiling a lexicon of Hebrew, Chaldee, Syriac, Samaritan, Ethiopic, Arabic, and Persian, working from 16 to 18 hours a day and having 14 assistants. This lexicon was published in 1669 as a supplement to the London Polyglot. The outlay was £12,000, which reduced him to poverty, but his losses were in part compensated by a number of preferments, among them that of prebendary of Canterbury and professor of Arabic at Cambridge. Castell assisted Dr. Walton in the preparation of the London Polyglot Bible (1653-57).

CASTELLAMARE DEL GOLFO, kās-tēl'-lā-mā'rā dēl gōl'fō. A seaport in the Province of Trapani, Sicily, near the mouth of the San Bartolommeo River and on the Gulf of Castellamare, 45 miles west of Palermo (Map: Italy, G 9). It was the port of the ancient Segesta, still carries on considerable commerce in grain, wine, and oil, and has tunny fisheries. Pop., 1901, 19,957; 1911, 17,367.

CASTELLAMARE DI STABIA, kās-tēl'-lā-mā'rā dē stā'byā (It., sea castle of Stabia). A leading city and seaport in the Province of Naples, south Italy, 17 miles southeast of Naples (Map: Italy, J 7). It has a cool, healthful climate, and the sea and mineral baths attract many visitors. On the hill to the south are the ruins of the castle to which the town owes its origin and its name—built in the thirteenth century by Emperor Frederick II and made stronger with towers and walls by Charles I of Anjou. The Villa Quisisana is on the site of a house erected by Charles II of Anjou and is surrounded by a beautiful park. Neighboring heights afford splendid views of the Bay of Naples and the surrounding country. Castellamare has an excellent fortified harbor and contains a technical school, a theatre, and a large royal arsenal for the building of warships. The principal imports are grain, coal, and iron; the principal exports wine and fruit. The fisheries are important, and there are macaroni, soap, leather, and cotton factories. Pop. (commune), 1901, 32,841; 1911, 33,579. Castellamare occupies the site of the ancient Stabiae, which

was desolated by Sulla during the Social War and which, with Pompeii, was destroyed in 79 A.D. by lava from Vesuvius. The elder Pliny perished here while watching the eruption. Here, in 1799, the French General MacDonald defeated the allied English and Neapolitan forces.

CASTELLAN, or **CHÂTELAIN**, shâ't'-lân' (Fr. *châtelain*, OF. *castellain*, *chastelain*, from ML. *castellanus* from *castellum*, castle, dim. of *castrum*, camp). In the Middle Ages, the keeper of a castle or burg. The same name was used for the feudal lord of high rank and for the simple custodian of a castle; hence some confusion has arisen. When applied to those of high rank in France and Flanders, the title "castellan" belonged to the holders of certain demesnes and was next in order of rank to that of a baron. In the later Middle Ages it applied to a lord having a castle and a fief with feudal jurisdiction. In Germany the castellan had the jurisdiction of a burgrave. In the Kingdom of Poland the castellans were part of the Senate or superior legislative chamber. The castellan of Craew was considered higher in rank than a palatine. Consult Luchaire, *Manuel des institutions françaises* (Paris, 1892).

CASTELLANETA, kâs-têl'-lâ-nâ'tâ. An episcopal city in the Province of Bari delle Puglie, south Italy, 24 miles northwest of Taranto. It has a cathedral and several convents and is a local market for fruit, olives, wool, and cotton. Pop., 1901, 10,196; 1911, 11,333.

CASTELLANOS, kâs'tâ-lyâ'nôs, JUAN DE. A Spanish soldier, priest, and poet, born in Seville about the middle of the sixteenth century. His principal claims to consideration are chronicles which he first wrote in prose and then turned into a poem, *Elegías de ilustres varones de Indias*, which gives a valuable historical account of the adventures of Columbus, Bobadilla, and Aguirre. It was published in 1558 and 1619. Afterward a second part and a third were added (1847-50). There was a fourth part, which has been lost, but not before the manuscript had been seen and used by Fray Pedro Simón and others. There has been some confusion concerning his birthplace. Consult Vergara y Vergara and Pinelo, *Bibliotheca occidentalis*. The works of Castellanos are to be found in vol. iv of the *Biblioteca de autores españoles*. His name appears in the Royal Academy's *Catálogo de las autoridades de la lengua*.

CASTELLI, kâs-têl'-lê, IGNAZ FRANZ (1781-1862). An Austrian poet. He was born in Vienna, whence he was sent out of the way of the French to Hungary, because of the excitement aroused in 1809 by one of his patriotic songs, *Kriegslied für die österreichische Armee*. The success achieved with his opera, *Die Schweizerfamilie*, which was set to music by Weigl, obtained for him an appointment as court poet at the Kärntnerthor Theater. He was a typical representative of the jovial humor of the Viennese, as exemplified in his *Gedichte in niederösterreichischer Mundart* (1828) and in his farces. He wrote more than 200 plays, principally translations and adaptations from the French. Perhaps his most popular drama was *Die Weise und der Mörder*. His collection of more than 12,000 plays, many portraits of celebrities, and a file of the playbills of the Viennese theatres from 1600 to 1862 is now in the Imperial Library in Vienna. His last publication was his *Memoiren meines Lebens* (4 vols., 1861-62).

CASTELLIO, or **CASTELLION**, SEBASTIAN. See CASTALIO.

CASTELLO. See PALEOLITHIC PERIOD.

CASTELLO, kâs-têl'-lô, GIOVANNI BATTISTA (c.1500-70). An Italian painter and architect, born near Bergamo and called Il Bergamasco. He was of the Genoese school, and his work has been confused with that of Cambiaso (q.v.), his friend and pupil. Philip II in 1567 called him to Spain to aid in the restoration of the Alcázar in Madrid and the building of the Escorial, the fine stairway of honor in which was designed by him. He painted a "Martyrdom of St. Sebastian" and a "Christ as Judge."

CASTELLO BRANCO, brân'kô (ancient *Castraleucus*). The capital of a district and an episcopal see in the Province of Beira, Portugal, 44 miles northeast of Abrantes (Map: Portugal, B 3). It is built on a hill crowned by a castle in ruins, is surrounded by walls, and has a cathedral and college. It has manufactures of cloth, and marble is quarried. Pop., 1900, 7292.

CASTELLÓN DE LA PLANA, kâ'stâ-lyôn' dâ lâ plâ'nâ (Sp., Castle of the Plain). A town of Spain, capital of the province of the same name, situated in a fertile plain, about 2½ miles from the Mediterranean, and 40 miles north-northeast of Valencia (Map: Spain, F 2). A magnificent aqueduct supplies the means of irrigation. Castellón de la Plana is, for the most part, regularly and well built and has a pretentious town hall and an octagonal bell tower, 260 feet high. The church of La Sangre contains fine examples of the works of Francisco Ribalta, the celebrated Spanish painter, who was a native of Castellón de la Plana. The town has manufactures of linen, woolen, sail cloth, paper, earthenware, and firearms, also brandy distilleries, and considerable trade. Pop., 1900, 29,966; 1910, 32,309. Castellón de la Plana, in earlier times, occupied an elevation a short distance to the north of the present site, where ruins are still extant, but in 1233 was moved to the plain by Jaime I. In 1837 the Carlists, commanded by Don Carlos in person, made an unsuccessful attack on the town.

CASTELNAU, EDOUARD DE C. See VOL. XXIV.

CASTELNAU, kâ'stêl-nô', FRANCIS, COUNT DE (1812-80). A French traveler and naturalist. He traveled in North America (1837-41); was chief of a French government scientific expedition to equatorial South America (1843-47), and was French Consul in South America and elsewhere—after 1862 in Melbourne. He published *Expédition dans les parties centrales de l'Amérique du Sud* (1850-61).

CASTELNAU, MICHAEL DE, SIEUR DE LA MAUVISSIÈRE (1520-92). A French soldier and diplomat. He was thoroughly educated, traveled widely, and saw active service with the French army in Italy, where his courage and ability secured for him the friendship and patronage of the Cardinal of Lorraine. In 1557 he received a command in the navy, but soon rejoined the French army in Picardy. He was the bearer of messages from the Dauphin (afterward Francis II) to his betrothed, Mary Stuart, and after the death of Francis accompanied the Queen to Scotland. In 1562 he returned to France in consequence of the civil war and served against the Huguenots in Brittany. Within the next 10 years he was employed on important missions to Elizabeth of England and to the Duke of Alva. After the battle of Saint-Denis (1567) he was sent to Germany to solicit aid against the Huguenots and on his return was

made Governor of Saint-Dizier. From 1574 to 1584 he was Ambassador of the English court and in this office attempted to effect a marriage between Elizabeth and the Duc d'Alençon. On returning to France he fell out of favor with the League, lost his governorship of Saint-Dizier, and was reduced almost to destitution; but on the accession of Henry IV he was again intrusted with several important missions. The *Mémoires* of Castelnau, published in 1621, are accurate and impartial.

CASTELNAUDARY, ká'stél'nó'dá'rě'. A town in the Department of Aude, France, 22 miles north-northwest of Carcassonne, situated on a declivity, skirted at the base by the Canal du Midi, which here expands into a basin and serves as a harbor (Map: France, S., F 5). Among other old mediæval architecture it contains the church of St. Michel (fourteenth century) and the hôtel de ville. It has manufactures of woolen and silk fabrics and earthenware, and carries on an active trade in grain, wool, flour, tiles, shipbuilding, chemicals, cattle and farm implements. Pop. (commune), 1901, 9397; 1911, 9542. It suffered severely in the crusade against the Albigenses and was in 1212 the scene of a battle between Simon de Montfort and Raymond, Count of Toulouse.

CASTELNUOVO, kás'tél-nwó'vó, ENRICO (1839-). An Italian novelist. He was born in Florence and was educated in Venice. In 1870 he edited the journal *La Stampa*, and in 1872 he became professor of the school of commerce in Venice. In the same year he published his *Racconti e bozzetti*, which was followed by his first romance, *Il quaderno della zia*, and a long series of successful novels. He was a regular contributor to Venetian scholarly journals.

CASTELSARRASIN, ká'stél'sá'rá'sán' (from *Castel-sur-Aizin*, the Latin *Castrum Cerrucium* or *Castellum Sarracenium*). The capital of an arrondissement in the Department of Tarn-et-Garonne, France, on the Garonne, 12 miles west of Montauban. It has ruins of a castle supposed to have been erected by the Saracens, and the church of St. Sauveur is an interesting twelfth to fifteenth century structure. Manufactures of serge, linen, hosiery, hats, lumber, flour, metals, and an agricultural trade are carried on. Pop. (commune), 1901, 7858; 1911, 6996.

CASTELTERMINI, ká'stél-tér'mè-nè (ancient *Camicianæ Aquæ*). A town in the Province of Girgenti, Sicily, Italy, 23 miles southwest of Caltanissetta (Map: Italy, H 10). It is noted for its extensive mines of rock salt and sulphur. Pop. (commune), 1901, 13,022; 1911, 15,092.

CASTELVETRANO, ká'stél-vá-trá'nò (Sicil. *Casteddu Vetranu*). A town in the Province of Trapani, Sicily, 20 miles southeast of Marsala (Map: Italy, G 10). It has an interesting old castle, some fine churches and convents, and a grammar school, in which is located the municipal museum of antiquities, many of whose objects were found at Selinus, in the vicinity. Grapevines, olives, and rice are extensively cultivated, and good wine is manufactured. There are also manufactures of coral and alabaster articles. Pop., 1901, 24,510; 1911, 24,674.

CASTELVETRO, ká'stél-vá'trò, LODOVICO (1505-71). An Italian critic and philologist. Born at Modena, he passed a life of study and research, marked by bitter personal quarrels and by unusual freedom from traditional opinions,

which in 1561 led to charges of heresy against him. He fled to Chiavenna in the Protestant Alps, where he remained till his death. His energetic criticisms of Bembo (*Giunte alle prose di P. Bembo*), his commentaries on Dante and Petrarch, his virulent attack on the style of Annibal Caro, his translation and exegesis of Aristotle's *Poetics* and his *Correzioni* to Varchi's *Ercolano* stimulated much of that revival of the study of æsthetics, criticism, and philology which was so influential in Italy and later in France in the sixteenth century. Without the aid of modern philological tools, he attained a view of the relation between Latin and the neo-Latin tongues that is substantially correct and in every respect superior to current opinion in his time. In etymology he showed similar competence. He was traditional in criticism in the sense that he regarded language as based on logic and not on intuition, and hence he did not gain that freedom from the trammels of rhetorical rule attained by Pietro Aretino and Giordano Bruno. An Aristotelian in this respect, he nevertheless was aware to a certain extent of the limitations of the Aristotelian rhetoric, and in his commentary to the *Poetics* he stated some of the problems "better and with greater acumen than the modern editors of Aristotle, not excluding Saint-Hilaire." For bibliography, consult Trabalza, *Storia della grammatica italiana* (Milano, 1908), and Charlton, *Castelvetro's Theory of Poetry* (Manchester, 1913).

CASTI, ká'stè, GIOVANNI BATTISTA (1724-1803). An Italian poet, and an adventurer of the Da Ponte and Casanova type. Casti lived a life of wandering, with important residences at Vienna especially and Paris, living on his wit and social address. A vivacious portrait of him is drawn in Da Ponte's *Memoirs*. His principal work is the *Animali parlanti*, an extensive social satire still much read and frequently reprinted. He wrote librettos for the Viennese opera with Paisiello as composer. Noteworthy also are the *Novelle galanti*.

CASTIGLIONE, ká'stè-lyó'nà. A city in the Province of Catania, Sicily, on the north slope of Mount Etna, 2035 feet above the sea, on the right bank of the Alcántara, 25 miles north of Catania (Map: Italy, Sicily, K 10). It has a castle and is a local market for wine, olives, and the best hazelnuts in Sicily. Pop. (commune), 1881, 9473; 1901, 12,998; 1910, 14,308.

CASTIGLIONE, BALDASSARE, COUNT (1478-1529). An Italian author and statesman. He was born at Casanatico, near Mantua, and studied in Milan. After the fall of the Sforzas in 1499, he served at the Gonzaga court in Mantua, fighting at Garigliano (1503). In 1504 he joined the court of Urbino, the leading centre of elegance at the time in Italy, where he divided with Pietro Bembo the honors of primacy in courtesy and erudite brilliancy. He rendered various diplomatic services to his patrons, filling missions in England and notably in Rome, where he was a friend of Raphael and where he spent long intervals of residence. Clement VII sent him in 1524 to Spain. His failure to prevent the sack of Rome led to charges against him. He was cleared of these aspersions, but he never recovered his peace of mind, and though highly honored in Spain, he died there, it was said, of a broken heart.

His *Cortegiano*, one of the landmarks of Italian culture, exposes the theory of Italian courtly

life in the Renaissance. Itself conceived in the form of a typical social assembly, it outlines the requisite attainments and gifts of a perfect gentleman, discussing the art of conversation, of dress, of etiquette, questions of intellectual culture, the ethics of courtesy, and the ideals of life, all on the background of the aristocratic court life of the time. The latter part of the work is devoted to woman and love, in an exposition of Platonic idealism. Taken with Bando's tales and Ariosto's *Orlando Furioso*, the *Cortegiano* offers a picture of the times that is almost complete. Best edition by Cian (Florence, 1894); consult Julia Cartwright, *Baldassarre Castiglione: His Life and Times* (New York, 1908); trans. by Opdycke (New York, 1903).

CASTIGLIONE, CARLO OTTAVIO, COUNT (1784-1849). An Italian philologist, born in Milan. With Angelo Mai, one of the founders of classical philology in Italy along modern lines. His most important contributions were in Oriental numismatics and literature, in the philological sources of Mediterranean history, and in the biblical translations of Ulfilas. Biography by Biondelli (Milan, 1856).

CASTIGLIONE, GIOVANNI BENEDETTO, called "in Grechetto" (1616-70). An Italian painter and etcher. He was born in Genoa and was a pupil of Paggi and Andrea de' Ferrari, but not, as was supposed, of Van Dyck. He is the best Italian animal painter with the exception of Bassano, and even his religious pictures usually represent scenes into which animals can be introduced: as, for example, "Noah Entering or Leaving the Ark" (Uffizi, Palazzo Bianco, Genoa, Dresden, Vienna), "Jacob with his Herds" (Madrid, Dresden, Genoa, Palazzo Bianco), "The Annunciation to the Shepherds" (Czernin Gallery, Vienna), etc. With a strong leaning to the fantastic, he painted also classic and mythological pieces, such as "Circe and Medea" (Uffizi), "Bacchanalian Scenes" (Turin), "Diogenes" (Madrid). His pictures are overflowing with life and spirit and crowded with living and inanimate objects: the contrasts of light and shadow are strong, the color rich and glowing. His numerous drawings are freer from mannerisms than those of any of his Italian contemporaries. His etchings (67 according to Bartsch, 72 according to Leblanc) are among the best produced in Italy during the seventeenth century. Although Rembrandt's influence is visible, they are essentially original in composition and management of light effects. In his so-called monotypes he printed freshly colored drawings directly on the paper. In 1564 he was appointed court painter to Duke Charles I of Mantua, and in that city he lived until his death.

CASTIGLIONE DELLE STIVIERE, *dell'la sté-vyā'ra*. A town in the Province of Mantua, north Italy, 6 miles south of the south end of Lake Garda (Map: Italy, E 2). It is connected by street railway with Brescia and Mantua, has two churches, a technical school, and a castle. Its chief industry is silk spinning. On Aug. 5, 1796, Napoleon defeated the Austrians under Wurmser here, and because of the victory Marshal Augereau (q.v.) received the title of Duke of Castiglione. Pop. (commune), 1901, 5067; 1911, 7124.

CASTIGLIONE, DUKE OF. See AUGEREAU, PIERRE FRANÇOIS CHARLES.

CASTILE, *kā-stel'* (Sp. *Castilla*, from *castillo*, castle, from Lat. *castellum*, fort, on account of the numerous castles erected on the fron-

tiers). A former kingdom of Spain, occupying an area of about 53,500 square miles in the central part of the peninsula (about one-fourth of the kingdom), and divided into the two old provinces of Old Castile, or *Castilla la Vieja*, and New Castile, or *Castilla la Nueva*. The former occupies the northern part and forms an elevated plateau, with an average elevation of about 2500 feet. It is walled in on almost all sides—on the north by the highest masses of the Cantabrian Mountains, which separate it from the Basque Provinces and Asturias (but at the centre of the northern boundary Castile extends beyond the mountains, through the district of Santander to the coast of the Bay of Biscay); on the south by the high ridge forming the watershed between the Duero and the Tagus; while the Sierras de Ocejón, de Urbión, and Moncayo, and the heights of León and Tras-os-Montes bound it on the east and west. The high plateau of Old Castile is but scantily watered, and its natural characteristics are far from inviting. The chief rivers are the Duero and its tributaries, which are generally shallow during the summer. In many parts nothing is presented to the eye but a wide, almost treeless waste of land, unrefreshed by streams, in some parts monotonously covered with stunted grasses and in others almost destitute of vegetation. The traveler may walk many miles without finding a village or even a solitary farmhouse. Not all of Old Castile is, however, an arid desert. In the southern part are found fertile tracts which yield fine grain, and even the olive can be cultivated under favorable climatic conditions. Iron and other minerals exist in plenty, but are not worked to any great extent, the chief industries being stock breeding and cotton and linen weaving.

New Castile constitutes the southern part of Castile and includes the Moorish Kingdom of Toledo. It lies between Aragon and Valencia on the east and Estremadura on the west, and has Murcia and Andalusia on the south. It belongs to the basins of the Tagus, Guadiana, and Júcar. It has a less elevated surface, but in many other respects is not unlike Old Castile. It is mostly sterile in the more elevated parts, such as the elevated plateau of Madrid or Toledo, but very fertile in the deep river valleys. Olives, corn, pulse, and saffron are cultivated in some neighborhoods, but more attention is paid to the raising of domestic animals. Industry is almost entirely restricted to manufactures of coarse woolen goods. The yield of the salt mines in the south is considerable, and quicksilver, especially at Almaden (q.v.), and iron are plentiful. The commerce is insignificant and is greatly impeded by the lack of adequate transportation facilities.

Under the present administrative division of Spain, Old Castile is divided into the eight provinces of Burgos, Logroño, Santander, Ávila, Segovia, Soria, Palencia, and Valladolid, with a total population of 1,785,400 in 1900, and in 1910, 1,851,286. Some authorities include also the provinces of León, Zamora, and Salamanca in Old Castile. New Castile is divided into the provinces of Madrid, Guadalajara, Toledo, Cuenca, and Ciudad Real, and had a total population of 1,923,310 in 1900, and 2,150,518 in 1910. Besides these provinces, the Principality of Asturias and the districts of Estremadura, Andalusia, Granada, and Murcia also belonged to the crown of Castile.

The early history of the Countship of Castile is shrouded in mystery. The kings of Asturias,

and later the kings of León, granted some such title as Count to their representatives in the various frontier cities as fast as they were won back from the Moors. But there seem to have been no counts of Castile before the time of the Count Fernán González. Little by little and with great difficulty did Fernán González win independence for his countship. After the battle of Simancas (Aug. 19, 939) and that of Zamora, which closed the campaign against Abderrahmán, Ramiro, King of León, quartered his troops in a burdensome way among the Castilian cities, to the great annoyance of the Castilians and of Count Fernán González, whose ideas of what made for the welfare of his subjects required their independence from León. The Count was a very skillful politician as well as a doughty warrior, and he weathered all storms until his death in 970, frequently exercising absolutely sovereign powers, and styling himself "Count by the Grace of God." As a result of various incidents and marriages and wars, the Countship of Castile, whose possessors had occasionally thought of raising it to the dignity of a kingdom, passed into the hands of the King of León, who at his death (1032) left Castile (with the title of King) to his son Fernando.

The Kingdom of Castile was thus an offshoot of the Kingdom of León, with which it was permanently reunited, so far as concerned the person of its sovereign, in 1230, when the death of Alfonso IX of León caused the crown of León to pass to the head of Ferdinand III of Castile, who thus became King of Castile and León. Castile played the leading part in the reconquest of the Iberian Peninsula from the Mohammedans, and as such its history is inseparably identified with that of Spain (q.v.). Consult: Ayala, *Crónicas de los Reyes de Castilla* (2 vols., Madrid, 1779-80), and *Historia de las comunidades de Castilla* (Madrid, 1897); for descriptions, J. M. Quadrado and V. de la Fuente, "Castilla la Nueva," 3 vols., in the series *España* (Barcelona, 1885-86); and Valverde y Alvarez, *Guía del antiguo reino de Castilla* (Madrid, 1886).

CASTILHO, kâ-stê'lyô, ANTONIO FELICIANO DE (1800-75), Viscount of Castilho, Knight of the Order of the Tower and Sword, and Knight Commander of the Order of the Rose of Brazil. A Portuguese poet, born in Lisbon. Although nearly blind from his sixth year, he was educated by a brother and early became well known for his learning. He published translations of the *Metamorphoses* of Ovid (1841) and other Latin translations and original poems. The first volume which attained success was *Cartas de Echo a Narciso* (1821). He also wrote *Amor e melancolia* (1882); *A primavera* (Lisbon, 1822; 2d ed., 1837); *A route do Castello* (Lisbon, 1836); *Escavações poeticas* (Lisbon, 1844); and an historical study or national poem concerning *Camões* (1849). Its subtitle, *Estudo historico-poetico liberrimamente fundado sobre um drama francez de Victor Perrot e Armand du Mesnil*, sets forth its provenience. In prose he wrote a treatise on Portuguese versification: *Tratado de metrificacão portugueza* (Lisbon, 1851); and *Quadros historicos de Portugal* (Lisbon, 1838; Rio de Janeiro, 1847).

CASTILLA, kâ-stê'lyâ, RAMÓN (1796-1867). A Peruvian general and statesman. He entered the Spanish army in 1816, but five years later joined the revolt against Spanish rule, and when independence had been secured he was appointed prefect of his native Province of Tarapacá

(1824). In 1830 he became chief of staff of the whole army, with the rank of brigadier general. After the treaty with the President of Bolivia, Castilla went to Chile, and in 1837 joined the Peruvians who marched against Santa Cruz, the President of Bolivia. When the Revolutionists late in 1837 proclaimed Gamarra President, Castilla was made Minister of War. In 1841 he was one of the leaders of the Peruvian force that invaded Bolivia, and in 1845 was elected President of Peru, at a moment when Peru's only salvation lay in a man, like Castilla, who had such power and force of character as would enable him to restore and maintain the reign of law and order. Castilla made many important reforms, and in his short term as President placed both the foreign and the internal debts of the country upon a sound basis and made regular payments of interest. His successor, Echenique, became unpopular through unscrupulous congressional manipulation of the country's finances, and Castilla started a revolution, overcame Echenique, and became, in 1855, sole ruler of the country. One of his most important reforms was the abolition of slavery, and another was the abolition of tribute paid by the Indians to the great landed proprietors. In 1858 he was re-elected President, and in 1860 proclaimed a new constitution which granted universal suffrage and prohibited the exercise of any religion except the Roman Catholic. In 1862 he resigned his office as President to his friend and successor, Grand Marshal Miguel San Román, and lived in retirement for the next three years. In 1865 he became President of the Senate. Peru owed him nearly 20 years of peace and of moral and material progress. Consult Markham, *History of Peru* (Chicago, 1892).

CASTILLEJO, kâ'stê-lyâ'nô, CRISTÓBAL DE (?1490-1550). A Spanish poet, born at Ciudad Rodrigo, Salamanca. He was early attached as a page to the person of the Infante Fernando, younger brother of Charles V, and subsequently Emperor of the Holy Roman Empire as Ferdinand I. After having taken orders he was in 1525 appointed secretary to that prince, who became successively King of Bohemia (1526), King of the Romans (1531), and King of Hungary (1540). He accompanied Ferdinand to the Diet of Augsburg, 1530, and almost everywhere throughout Austria and Bohemia. His family was ennobled in 1532, and in 1536 he was appointed to a benefice at Ardege in the Bishopric of Passau, but resigned it in 1539 to accompany Mendoza, who went to Venice as Ambassador. Castillejo was never robust, and he aged early. Towards the end of his life, too, he was poor. His comedies have entirely disappeared, but his poems survive. Although some of his poems appeared in 1543-44, they were not collected until 1573, when the Inquisition issued, at Madrid, an expurgated edition. There is also a Madrid edition of 1792 in 2 vols. The most accessible edition is that by Adolfo de Castro, in vol. xxxii of the *Biblioteca de autores españoles* (Madrid, 1854), in which an attempt has been made to restore the original readings before the Inquisition had mutilated the text. The work is divided into three books, treating respectively *Obras de amores*, *Obras de conversación y pasatiempo*, and *Obras morales y de devoción*. In them he displays spontaneous gayety of mind and facility of execution. He adhered to the traditional native forms and stoutly resisted Boscan, Garcilaso de la Vega, and all the remaining inno-

vators who sought to introduce into Spanish literature the sonnet, the *terza rima*, the canzone, and other Italian measures. His opposition was in part indirect, through improvement upon the old Castilian masters, and in part direct, as expressed in a satire against the new school and the sneers of "Petrarquistas." He wrote many successful ballads and a "Dialogue with his Pen" (*Diálogo entre el autor y su pluma*), often referred to for its sprightly wit. Almost equally witty are the satirical poems: *El sermón de amores del maestro Buen-talante*, *Fray Fidel, de la órden del Tristel*, and the *Diálogo que habla de las condiciones de las mujeres*. Castillejo appears in the Academy's *Catálogo de las autoridades de la lengua*. Consult C. L. Nicolay, *Life and Works of Cristóbal de Castillejo* (Philadelphia, 1910).

CASTILLEJOS, MARQUIS DE LOS. See PRIM, JUAN.

CASTILLO. See CÁNOVAS DEL CASTILLO.

CASTILLO, ká-stē'lyó, DOMINGO DEL. A Spanish pilot, one of the first European party to explore the Colorado of the West, in 1540. He left an excellent map of the Gulf of California and the lower course of the Colorado. See ALARCÓN, HERNANDO DE.

CASTILLON, ká-stē'yón'. A town in the Department of Gironde, France, on the right bank of the Dordogne, 26 miles east of Bordeaux. It is celebrated as the scene of the battle (July 17, 1453) between the forces of the English and the French, in which the former were defeated and their leader, Talbot, was slain. The battle led to the speedy reoccupation by Charles VII of all the territory held by the English except Calais. Pop., in 1901, of town, 2891; of commune, 3253. Consult Jouanett, *Statistique du département de la Gironde* (Paris, 1837-39).

CASTINE, kás-tén'. A town and port of entry in Hancock Co., Me., on Penobscot Bay, 36 miles below Bangor (Map: Maine, D 4). It has a good harbor and steamship connections and some reputation as a summer resort. The chief industry is the manufacture of cordage, fishlines, etc., and a trade in fish is carried on. Castine has a library and a customhouse and is the seat of a State normal school. The government is administered by town meetings. Pop., 1890, 957; 1900, 925; 1910, 933. The French erected a fort here in 1613, and in 1667 Baron de Castine established a small colony, which was soon abandoned. The English made the first permanent settlement here in 1760, and during the American Revolution in 1779 took possession of it, evacuating four years later. It was again occupied by them in 1814.

CASTING. See FLY CASTING.

CASTING, METAL. See FOUNDED.

CASTING OUT NINES. See CHECKING.

CASTING VOTE. The final and decisive vote which the law in some cases confers on the presiding officer of a meeting in the case of an equality or tie vote. Whether such officer has the right to vote at all, or whether his right is limited to a casting vote, or whether, having the right to vote with the others, he may thereafter give a casting vote, is determined by the rules governing the particular assemblage. The President of the House of Lords votes with the other members, but has no casting vote; while the Speaker of the Commons votes only when there is a tie. By the American Constitution the Vice President is President of the Senate, but has no vote except in case of a tie (Art. I,

Sec. 3). State constitutions contain similar provisions relating to the lieutenant governor. The Speaker of the Federal House of Representatives is chosen from among its members, and in some cases has the casting vote in addition to his vote as a member of the House. In State legislatures the usage varies, the Speaker of the Lower House being limited, not infrequently, to a single vote which must be given with the votes of the other members. The same rule applies to the presiding officer at a meeting of a corporation, unless the charter expressly gives him the additional right of a casting vote. See PARLIAMENTARY LAW, and the authorities there cited.

CAST IRON. See IRON AND STEEL, METALLURGY OF: FOUNDED.

CASTLE (Lat. *castellum*, a fort). The mediæval castle was of double descent, on the one side from the Greek acropolis, the Roman Capitol, and the citadel of the Byzantines and Goths; and on the other from the Roman camp or fort, and the Romano-Frankish villa—the earliest feudal fief. (A general treatment of this subject will be found under MILITARY ARCHITECTURE.) The principal groups of such monuments are in Normandy and England; in northern France; along the Rhine; in northern Italy and the Roman province; and in a large part of the East, in a series belonging both to the Byzantine and Mohammedan Middle Ages.

A castle differs from a fort in being primarily the permanent residence of a feudal lord, his family and dependents, instead of merely a stronghold occupied by a garrison. Castles may be divided into two classes: castles built for the defense of cities and subordinate to them—as at Carcassonne; and castles either entirely independent or connected with towns of little importance which often grew up around them. This class is the most numerous and most characteristic of the times; it is, in fact, the great outward sign of feudalism. It will, therefore, be here treated almost exclusively.

Castle architecture ran its course from the tenth to the fifteenth century, and is representative of a large part of the life of the times. In the Orient it may be studied in three principal classes—Byzantine castles, Mohammedan castles, castles of the Crusaders. In the West its natural divisions are rather chronological—pre-Norman, Norman, Crusading, Feudal, and Palatial Château periods. As a class, castles are even more important for what they represent than for what they are. In the form with which we are most familiar they are the creation of the nations of the North, under early influences, typifying at first the stern, self-reliant individualism of feudal society, its absorption in the ideas of graded dominions and the fostering of strong men. In studying its history we can trace the gradual softening of these ideals until the self-indulgent life of the Renaissance château is finally reached. But the border wars of Scotland, the feuds of Richard Cœur de Lion and Philip Augustus, the Barons and Magna Charta, and such events and atmospheres are not the only kind illustrated. The border wars of the Byzantine emperors and the Mohammedan emirs, the struggles of the Knights Templars and those of St. John, the vicissitudes of the Old Man of the Mountain and his Assassins, also in their history crystallize around great castles in the East.

A word of explanation as to their origin. In the north of Europe, where timber abounded, the old Roman *castella* or detached military posts

were often at first used, reinforced by palisades and wooden towers. The Frankish fortified villa was a quadrangle like a Roman camp, surrounded by ditch and palisade and having a mound in its centre as a final place of defense, surrounded by a trench and topped by a circular or polygonal wooden donjon or keep from 10 to 30 meters in diameter and 3 to 13 meters high. This was the pre-Norman castle of the north (e.g., at Sainte-Eulalie d'Ambarès and at Friedberg). Sometimes the circular form was preferred for the outer works, as in the Pipin Burg near Lehr (Germany). Such works have of course left few traces, except of the roughest ground plan of their earthworks. When the Normans settled down in the north of France in the tenth century, they began to build castles of a new type: their keeps, instead of being in the centre of a rectangular inclosure, were at one of its edges, so that direct communication with the outer country could still be had in case the outer palisades were captured. The materials remained at first the same—earthworks with palisades and a bank; then an earthen *motte* or mound, and wooden towers at the highest point. It was with such castles that the Norman chiefs repelled the Hungarian hordes during the tenth century and kept the river courses open for their raids. They took advantage, however, of the natural strength of localities better than the Franks, who, like the Romans, had built usually on the plain. The Norman castles in France and England even for a generation after the Conquest were of this kind, e.g., at Builth in South Wales, Longtown, and Kilpeck in Herefordshire. The first advance was made late in the eleventh century by building the keep or donjon of stone masonry instead of earth and immeasurably increasing its importance in relation to the outer line of earthworks. The keep at Malling in Kent, and London's famous keep, the White Tower, are survivals of this stage, which lasted, for the majority of castles, well into the twelfth century. England was covered with them; they were the principal means of firmly establishing the Norman yoke. Thirty went up under William the Conqueror; many more under his sons, and under Stephen (1135-54) 1115 were built. Meanwhile a great innovation had begun, as usual not in England, but on the Continent. Earthworks were discarded altogether and a complex system of stone-wall defenses was connected with the stone keep. It is at Arques, in Normandy, that William, uncle of Duke William, erected on a strong rocky promontory an epoch-making castle, with a square donjon at the upper end and with the entrance at the lower end protected by a double gate, two flanking round towers, and advanced earthworks. The interior had two courts or baileys—lower and upper—separated by a palisade. The circuit of walls was defended by 11 towers—all but two round. The donjon was against the outer wall. The natural rise towards the castle was defended by a palisade in front of a "vallum"—called a *bailie* or *bailey*, in its primitive sense—back of which a wide fosse was cut in the soft rock from the scarp of which rose the castle walls. Along this scarp subterranean corridors were cut to detect and oppose mining approaches, and the whole substructure was honeycombed with subterranean passages for sallies and intercommunication between the various parts. But Arques remained for a century a great exception in the importance of its outer circuit. As soon as the

improved methods reached England many castles were rebuilt, such as "Dover and Rochester in Kent, Newcastle in Northumberland, Appleby and Carlisle in Cumberland, Brougham in Westmoreland, Richmond and Conisborough in Yorkshire, Portchester in Hampshire, Guildford in Surrey, Goodrich in Herefordshire, Norwich and Castle Rising in Norfolk, Hedingham and Colchester in Essex." (Parker.) They vary but slightly in plan, the keep being a massive square tower, with a square turret projecting from each angle. The entrance was quite high up, by a temporary wooden staircase, removed in time of danger. The interior was often divided by a vertical wall into two equal sections without communication except through passages cut in the upper part of this heavy division wall. The stories were divided by wooden floors, very seldom by vaults. These keeps were small, dark, and uncomfortable, and until the later period when the outer defenses were strengthened, they not infrequently succumbed to famine after the outer works were carried. This type, which has been described as "a strong post around which a fortified camp was traced," was followed in Normandy itself, at Chambois, Falaise, Nogent-le-Rotrou, and Le Pin; also in the French provinces under Norman influence, as at Chauvigny, Loches, Pouzanges, Montrichard, Montbazou, Beaugency, etc. Often the keeps of such castles were supplemented during the twelfth and thirteenth centuries, or even later, by stronger outer lines of defense than was customary when they were first built. The outer walls had been really only for the protection of the outbuildings from marauders, not to withstand an attack in force. Hitherto, even with these improvements, the castles of this type were incapable of offensive defense and became thoroughly insecure. Its abandonment in favor of a type with stronger external defenses came as a result of the Crusades. The Crusaders had brought experience in approaching and attacking fortifications and were familiar with advanced methods of sapping and mining, with heavy machines and towers or belfries, through contact with the skilled engineers and their works among the Byzantines and Mohammedans of the East. A revolution took place in the plans of European castles, especially in France, before the close of the twelfth century. It is connected, however, rather with royal castles built for national purposes with all the resources of the state, than with the private efforts of feudal nobles. This movement is individualized first at La Rocheguyon, built by Philip Augustus of France, and then, even more superbly, by its greater rival Château Gaillard, built by Richard Cœur de Lion, which defended all Normandy against France. At Gaillard the Eastern method of flanking constructions, by which an aggressive defense could be made, was first carried out; the type of square donjon, which enforced ignorance of exterior operations and was weak for defense at the angles, was abandoned for the circular form; in fact, curved lines were everywhere employed. Another important innovation was the double concentric line of defense of the main castle, beside the keep. This central fort had a strong, irregularly triangular advanced fort separated from it by a trench, and with its nose towards the narrow strip of land that was the only vulnerable point of approach. The river Seine, that flowed by its base, and by a short curve there formed a promontory, was for-

tified in various ways—by a fort on an island defending a bridge with a barbican (q.v.) at one end and a large fortified burg at the other, with another farther on, all near the water level, while above it a triple stockade barred the river. The whole system was, perhaps, the most perfectly devised of the feudal age: in it everything was sacrificed to military efficiency. It was by such works that the quality of masonry was perfected. Of the French donjons, or keeps, the most important of this period, now preserved, is that of Loches, still over 30 meters high. A little later was built (1223-33) the famous castle of Coucy, the most wonderful of mediæval private fortresses, exhibiting for the first time the tendency to unite artistic magnificence and comfort with perfect military strength. Other important French donjons are those of Foulques-Nerra at Langeais (very early), Provins, Hardan, and the double keep of Niort. The new principles of Gothic architecture, with its mastery of vaulted construction, alone made this possible. The chapels, halls of the knights, and halls of the feudal lords became structures of great size and high finish. Such were the old Louvre of Philip Augustus at Paris, the châteaux of Clisson and of Angers, and other royal castles of the thirteenth century. Under Oriental influence the old wooden balconies or hurdles (*bourds*) had long been replaced by stone-vaulted projections, galleries, and bartizans (*machiculis*, *échauguettes*), thus doing away with the main defensive weakness of earlier castles. During this period the normal form and division of the most numerous class of castles, the Norman-English, was the following: A ditch, dike, fosse, or moat, surrounding the circuit, crossed by a bridge defended by a barbican and closed by a portcullis; then the outer wall or curtain, 20 to 25 feet high, with its towers and bastions, its terraced walk, with single or double parapet; then the gatehouse flanked with towers, leading into the outer bailey court with buildings for feeding, organizing, and lodging the garrison; then a second and higher inner line of defense with its fosse and gatehouse, within which is a second or inner bailey, at the end of which is the keep containing hall, chapel, and accommodations for the suzerain or lord. These arrangements are more or less completely exhibited at Carcassonne, Coucy, Krak des Chevaliers (Syria), Carnarvon and Conway castles, and many others. Under the Plantagenets a small mound, called cavalier, was often added. At this time in England, and under the Valois in France, a great change in arrangement took place, characteristic of the increasing luxury of the fourteenth century. The inner court or bailey, instead of being merely a part of the defensive system culminating in the keep, became a centre of architectural splendor which now showed itself for the first time on the exterior. This culminated in such famous royal structures as Pierrefonds and La Ferté-Milon in France and in such private castles as that of Vitry. Prominent English castles were Rochester, Windsor, and Alnwick.

An entirely distinct line of development had been meanwhile in progress in Italy, where it was not necessary, as in the North, to start from nothing. The feudal class established or encouraged by the Carolingians could usually fortify themselves in ancient ruins of great strength, and they had before them Roman and Byzantine models which they carefully imitated. The

tenth century saw the founding of many feudal houses; and the great monasteries, such as Farfa, Subiaco, and Monte Cassino, in the fortresses by which they defended their possessions, furnished models to the barons. The Roman nobles were among the earliest to develop a type of castle: families like the Crescentii and Pierleoni, and later the Vico, Orsini, Colonna, etc., erected strongholds throughout the Roman province that far surpassed in size and magnificence any of the Norman or Rhenish castles, and were equaled only by the French and English castles of the thirteenth century. Such were Borghetto and Marozza. The dark, narrow, and unlivable Norman keeps would have seemed insufficient to families that held as their city fortresses such great antique buildings as the Colosseum, the Theatre of Marcellus, the Mausoleum of Augustus or of Hadrian, and the Circus Flaminius. Unfortunately nobody has ever studied this phase of Roman architecture. In most other parts of Italy the establishment of the free communes led to the destruction of such castles during the twelfth and thirteenth centuries, as dangerous to the liberties of the people, and the nobles were forced to come to the cities to live, abandoning their mountain strongholds. This was the case first in the North and then in Tuscany. Only when the age of tyrants set in, in the fourteenth century, with the Scalas, Viscontis, Sforzas, Castracanis, did a new era of feudal castles begin in the North. Still, in the extreme north—in Piedmont, Savoy, and Upper Lombardy—there had been great feudal strongholds from the tenth century, as at Bard and Challant. The famous castle of Canossa, where the Emperor Henry IV made his submission to Gregory VII, was one of these. Frederick II, largely through the Arab engineers he employed, introduced the advanced Oriental methods before 1250. His castles at Lucera, Barletta, Castel del Monte, and elsewhere were worthy, in size and magnificence, of their northern contemporaries. His French successors, the house of Anjou added other features from beyond the Alps, and the south of Italy then saw the greatest development of military architecture in the peninsula (thirteenth and fourteenth centuries). Farther north the new style was exemplified in such structures as the castle of Castracane at Avenza (1322).

In Germany the architecture of the castle had remained during all this time in its infancy. It had retained the earthwork system up to the twelfth century and even the thirteenth century, as at Alt-Sternberg in Westphalia and the Prussian castles of the Knights of the Cross. In the twelfth century stonework was introduced in the more advanced regions. We admire the picturesque ruins of the castles along the Rhine, such as the Drachenfels, Ockenfels, Ehrenbreitstein, Lahneck, Rheinfels, and many more. They did not embody any of the improvements we have noticed. Even as late as the thirteenth century the German castles were unprovided with any flanking defenses for their outer fortifications, and they kept to the antiquated type of square donjon, rectilinear outer line of walls—in short, the simply passive system of the eleventh century—relying on the natural rocky situation. They were small, piratical aeries, never once entering the same class as Château Gaillard, or even Arques. Still, the elaborate network of these forts, their grouping to protect the whole Rhine valley, its cities and towns, make them

interesting as a social and political, if not as an engineering, study. Even socially, however, they did not show the concessions to comfort and magnificence in feudal life that we find in France, although it is stated that over 350 feudal castles were erected under the Hohenstaufens. Typical examples are the two castles at Rüdeshelm, with three superposed terraces, but without wall towers or advanced works—with a typical *mota* in stone—a mere transformation of the old earthenworks. At Egisheim the keep or *mota* is a regular octagon inscribed in the centre of a larger regular octagonal wall circuit—symmetrical, but absurdly inadequate in view of the advances made in contemporary modes of attack. A fuller development of this scheme is at Steinberg (twelfth century), with triple concentric lines of walls. There are, however, some interesting exceptions. Salzburg, near Neustadt (eleventh and twelfth centuries), bears certain resemblances to Arques, with its ditch cut along the crest of the hill, its two outer baileys and an inner one with a small keep; the wall towers, however, are square. Interesting, historically, is the famous Wartburg Castle (eleventh and twelfth centuries) of the landgraves of Thuringia, with its double bailey and its attempt to unite the great palatial residence with the fortress, a form in which the Germans anticipated the French of the thirteenth century. Here the palace hall was a long structure in the inner bailey quite distinct from the keep. The Frankenburg Castle in Alsace (eleventh to thirteenth century) is interesting for its two keeps—one of the primitive rectangular type, the other later and circular. At Landeck, near Klingenmünster (twelfth and thirteenth centuries), we see not only the peculiar German scheme of superposed retreating platforms or baileys, but the unusual presence—for Germany—of square and round towers in the outer circuit. These and others are in Alsace and the Bavarian Palatinate. The castle at Münzenberg shows how in many cases of an extremely oblong plan there were two keeps in place of one, because as it became necessary to have a keep near the edge of the defenses, and often at the most vulnerable end, a second centre was required for the other end. Among the castles which, in the course of the advance made during the twelfth and thirteenth centuries, showed how even Germany had discarded all reminiscences of the Romano-Germanic *mota* or central earth mound is Fleckenstein in Alsace. Trifels and Neuscharffenek further develop the combination of fortress with palatial halls, which was characteristic of the Wartburg, and no longer sacrifice the architectural beauty of their buildings to safety. The castle of Nuremberg is a superb example of a feudal structure commanding a great city (twelfth century). Its narrow, rocky setting gives it not only a strong walled advanced work towards the town and a double encircling wall, but three successive baileys on ascending levels, divided by deep ditches, heavy walls, and towered entrance gates. Like so many other German castles, the palace takes the place of the keep in the inner bailey. This tendency reaches its climax in such extensive castles as that of Friesach, in the thirteenth century, where the main palace is in the form of a quadrangle in the centre of a long and fairly fortified enceinte and double outlying baileys and a central keep adjoining the palace. But far surpassing all private and even all royal castles in

Germany is the central fortress of the Teutonic Knights, Schloss Marienburg, whence they extended their political power and the Christian religion over North Germany, and even flung down the gauntlet to Poland. It represents the highest efforts of the German Gothic style in the military field, surpassing in mere beauty its prototypes in Palestine, of which we shall speak. Its great chapel, knights' hall, refectory, and other structures of the inner bailey, superbly grouped, are works of art both without and within, the brunt of military defense being borne by the outer lines of fortification. In the South the castle of Karlstein (1347) in Bohemia is probably the most magnificent.

Spain was undoubtedly the last of Western countries to abandon the purely military castle; this was due to the long conflict between the Christians and the Moors, lasting to the very close of the fifteenth century. The Alhambra, at Granada, shows how the Moors ended by combining art and military science, and the immense piles at Coca and Olite show the permanence of the purely military architecture among the Spaniards. Feudalism of a certain kind had flourished in the Mohammedan East after the breaking up of the caliphates of Bagdad and Cordova into smaller independent principalities. The castle fortress had been developed by the Byzantines of the time of Justinian to a high degree of strength and scientific value, and they had inherited the old Oriental knowledge of double and triple lines of fortification and an overlooking acropolis, the specialty of the Hittite and Pelasgic peoples. The Arabs had borrowed from the Romans and Byzantines the idea of a frontier line of defense, but they outdid them in their scientific treatment and situation. The local chiefs on the frontier established real feudal dynasties. Syria and Asia Minor are full of these frontier castles, whose castellans held the safety of the Arabic and Byzantine empires respectively in their hands. The studies of Rey (*Architecture militaire de la Syrie*) have shown how superb were the fortifications erected in Syria by the Crusaders in the early twelfth century; those of M. Bourgoïn have proved that Mohammedan castles furnished the models for these works. While the Normans were putting up rudimentary earthworks, the chiefs of Syria were living in castles built of cut stone. This explains why the warriors returning from the first Crusades shortly after 1100 revolutionized the science of military architecture in the north of Europe, and why for the origin of the great French and English castles of the thirteenth century we must go, as for many other things, to the East. In fact, for the origin of the mediæval forms then adopted we must study the fortifications of Dana, Edessa, Antioch, and other places in Syria and Mesopotamia, built by Justinian and his successors.

The earliest of the remaining Crusaders' castles is supposed to be that of Giblet (Djebel), a square plan with angle towers and a central square keep, and others like it at Blanche-Garde and Ibelin. A more advanced system is shown at Saona (c.1150), which is an example of the Syrian castles here planned to contain large garrisons. Its square Norman keep is supplemented by four bastions. Still further progress was made at Beaufort with two enceintes, two keeps, and some heavy bastions. These are followed at the close of the twelfth

century by a different class of castles, those of the orders of Christian Knights that were the strongest defenders of the Holy Land. The Knights Templars had their central stronghold at Tortosa (1183) on a rocky projection in the sea by the city, and surrounded on its elliptical land side by a wide double moat cut in the rock into which the sea could be turned, cutting off the fortress altogether. The two lines of defense separated by the moats were independent and both defended by square towers. The great keep on the farther side is also isolated by water. Although Tortosa is unsurpassed among Syrian fortresses in perfection of construction and is equal to the greatest in Europe, the castle of the Knights of the rival order of St. John built on the Orontes, and commanding the road between Homs-Hamah and Tripoli-Tortosa, is the most important of all, and still remains substantially perfect. It is commonly known by the name of Le Krak des Chevaliers, and stands in the same class as Château Gaillard, which it surpasses in size, is more advanced in scientific construction than Tortosa, and could easily hold a garrison of 4000 men. It should be compared with the great contemporary city castle of Carcassonne in France. It was provided with two large barbicans, with square and round towers, and is built with a high terraced inner bailey magnificently defended and commanded by a barbican keep. A fortified, inclined, winding esplanade connects it with the lower outer bailey. Architecturally these castles of the Knights afforded great opportunities. It was necessary to provide immense halls for the reunion of so large a mass of men—amounting often to a small army—men of equal rank, not underlings, as in the ordinary castle garrison. These edifices were military monasteries and had halls corresponding to the monastic churches, chapter houses, and refectories. Such castles presented altogether new problems to military architects, who for the first time worked out schemes for uniting outward strength with extensive interior halls. The result undoubtedly made possible the Valois-Plantagenet type in the West. Here, as in every other element of the castle, the type was created in the East. To the class of mere fortresses belong the two most interesting of Turkish castles, both built on Byzantine models—that of Rumeli-Hissar, built 1453 by Mehmet II, and that of Yedi-koulé (Seven Towers), a partial reconstruction of a Byzantine fortress at one end of the city walls. They are both in a fair state of preservation.

During the fifteenth century the castle was gradually becoming the palace. In Italy the change was rapid and complete; in France and Germany, very gradual. The fortress-like palace of the Louvre at Paris, even after its extensive reconstruction in the fourteenth century, retained the moat, machicolated towers and dungeon (demolished in 1446); Vincennes was another transitional palace. Indeed, until the latter part of the sixteenth century the French rural palaces retained the moat, machicolated round towers, thick walls, and high roofs of the mediæval castle, as at Chaumont, Chambord, Chenonceaux, Azay-le-Rideau. Under the Bourbon kings, however, the definitively Renaissance palace type finally lost the last vestige of mediævalism; but the name *château* is retained to this day to designate any important manor house or large residence in an extensive estate.

Bibliography. Very few books treat ade-

quately of this subject. For France, consult the articles "Architecture militaire," "Château," "Donjon," "Siège," and "Tour," in Viollet-le-Duc, *Dictionnaire raisonné de l'architecture française du XI^e au XVI^e siècle* (10 vols., Paris, 1876), and the second volume of Enlart, *Manuel d'archéologie française* (Paris, 1904). For Germany, a partial exposition is found in Cori, *Bau und Einrichtung der deutschen Burg im Mittelalter* (Linz, 1895); Nacher, *Die deutsche Burg* (Berlin, 1885); Essenwein, *Die Kriegsbaukunst* (Darmstadt, 1892); id., *Burgenkunde* (Munich, 1895); Salvisberg, *Die deutsche Kriegsbaukunst* (Stuttgart, 1887). For castles of the Crusades, consult Rey, *Etude sur les monuments de l'architecture militaire des croisés en Syrie* (Paris, 1871), and for England and Scotland, McGibbon and Ross, *Castellated and Domestic Architecture of Scotland from the Twelfth to the Eighteenth Century* (Edinburgh, 1887-97); Clark, *Medieval Military Architecture* (London, 1884); Britton, *Architectural Antiquities*, vol. iii (London, 1807-26); and A. H. Thompson, *Military Architecture in England* (London, 1912).

CASTLE, EGBERTON (1858-1920). An English novelist, born in London. He was educated at the universities of Paris and Glasgow, at Trinity College, Cambridge, where he took honors in science, and at the Royal Military College, Sandhurst. He served as lieutenant in the Second West India Regiment and as captain in the Royal Engineer Militia. From 1885 to 1894 he was on the staff of the *Saturday Review* and is now joint owner of the *Liverpool Mercury*. His novels, several of which have been dramatized, include: *Consequences* (1891); *The Light of Scarthey* (1895); *Young April* (1899); and in collaboration with his wife, Agnes Castle, *The Pride of Jennico* (1898); *The Bath Comedy* (1899); *The House of Romance* (1901); *The Star-Dreamer* (1903); *If Youth but Knew* (1905). For Henry Irving he wrote the play *Saviolo*, and for Richard Mansfield *Desperate Remedies*. He also published two books on fencing and one on bookplates. *The Secret Orchard* (1900) was dramatized for Mr. and Mrs. Kendal (1901). Among other publications in which he collaborated with his wife are: *Incomparable Bellairs* (1904); *Wroth* (1908); *The Grip of Life* (1912); *The Golden Barrier* (1913).

CASTLE, WILLIAM ERNEST (1867-). An American zoölogist, born at Alexandria, Ohio. He was educated at Denison and Harvard universities. In 1889-92 he was instructor in Latin at Ottawa (Kans.) University, in 1895-96 instructor in vertebrate anatomy at the University of Wisconsin, and in 1896-97 instructor in biology at Knox College. He was then called to Harvard, where in 1908 he became professor of zoölogy. Besides his articles on embryology, animal morphology, and heredity in the *Contributions from the Zoölogical Laboratory of Harvard* and in the *Publications of the Carnegie Institution of Washington* he is author of *Heredity in Relation to Evolution and Animal Breeding* (1911); *Heredity and Eugenics* (1912); *Reversion in Guinea Pigs and its Explanation*, with C. C. Little (1913).

CASTLEBAR, kás'ŭl-bär'. The capital of Mayo Co., Ireland, on the Castlebar River, 159 miles northwest of Dublin (Map: Ireland, B 3). It takes its name from the ancient castle, formerly the property of the De Burgh family. It

has manufactures of coarse linen and breweries. In the rebellion of 1641 the English parliamentary garrison was massacred by the Irish. In 1798 the French, under General Humbert, held the town for a fortnight. Pop., 1901, 3585; 1911, 3698.

CASTLE DANGEROUS. A novel by Sir Walter Scott, published in November, 1831, although the introduction printed in later editions was not forwarded from Naples until February, 1832. The scene is laid in the times of Robert Bruce and James, Earl of Douglas, and the plot centres about Douglas Castle, Douglas Dale, Scotland, a fortress which is now a ruin, but which in older days was known as Castle Dangerous.

CASTLEFORD, kās'l-fērd. A town in the West Riding of Yorkshire, England, on the Aire, 9 miles southeast of Leeds, with which it is connected by rail and canal. Its principal industry is glassworking, in particular the manufacture of bottles. Pop., 1901, 17,400; 1911, 23,090. Castleford was the Roman *Legeolium*.

CASTLE GARDEN. A large circular building in Battery Park, at the southern extremity of New York City. Built in 1807, originally as a fort, then 300 yards from the shore, and known as Castle Clinton, it was converted into a garden where civic receptions and other functions were held, whence its name. Subsequently it served as a concert hall, and in 1855 became a landing place and temporary headquarters for immigrants. At the close of the year 1890 it was ceded to the municipal authorities; and, under the control of the Park Department, has since been equipped as a large public aquarium, with over one hundred tanks, and an admirable collection of fresh-water and salt-water fishes and other aquatic life. Its present interest is overshadowed by its past, for with it are linked in history the names of Lafayette, Presidents Jackson and Tyler, and Jenny Lind. See **AQUARIUM**.

CASTLEMAINE, kās'l-mān. A town in the State of Victoria, Australia, 78 miles north-northwest of Melbourne (Map: Victoria, D 5). Pop., 1901, 5704; 1911, 5228 (exclusive of full-blooded Australian aborigines). It was a place of much importance when gold mining began, the diggings near by being among the earliest opened. The Melbourne to Echuca Railroad passes through the town.

CASTLE OF INDOLENCE, THE. An allegorical and descriptive poem by James Thomson. It was first begun as a humorous autobiographical sketch, but soon outgrew the original conception. The first edition appeared in London, in quarto, 1748; the second, in octavo, in the same year and place. The piece is noteworthy for its revival of the Spenserian stanza and for its effective onomatopoeia.

CASTLE OF OTRANTO, ð-trān'tō, THE. A "Gothic" novel by Horace Walpole, published anonymously in December, 1764, but appearing under the author's real name in the second edition. It professed, in the original mock-antiquarian introduction, to be a translation from the Italian. In later editions, however, the author frankly expounded his theory of the interest which a blending of the supernatural with a realistic setting must possess for the average reader.

CASTLE OF SAINT AN'GELO. See **HADRIAN, TOMB OF.**

CAS'TLE PEAK. One of the highest peaks

of the Sierra Nevada in California, rising to 12,500 feet above the sea, in lat. 38° 10' N. and long. 119° 30' W., about 25 miles northwest of Mono Lake (Map: California, F 4). The lower slopes are well wooded.

CASTLE RACKRENT. A novel by Maria Edgeworth, published first anonymously in 1800 and then under the author's real name. It is an Irish story, the scene of which is laid in the eighteenth century, and was doubtless suggested by Miss Edgeworth's visit to Ireland after her father's remarriage. Its principal characters are members of an Irish family on the downward grade. It is, however, interspersed with many humorous passages.

CASTLEREAGH, kās'l-rā', **VISCOUNT.** See **STEWART, ROBERT**, second **MARQUIS OF LONDONDERRY**.

CASTLES. In heraldry, castles often figure as charges. The castle appears in the arms of Castile and of many cities, e.g., Bristol, Newcastle, and Carlisle.

CASTLETON, kās'l-ton. Formerly a town in Richmond Co., N. Y., in the northern portion of Staten Island, now included in the Borough of Richmond, New York City (Map: New York City, B 7).

CASTLETON. A town in Rutland Co., Vt., 11 miles west of Rutland, on the Delaware and Hudson Canal Company's Railroad and on Castleton River (Map: Vermont, B 6). The valuable slate quarries in the town constitute the principal industry; there are also some dairying interests. Castleton is the seat of a State normal school. Lake Bomoseen, the largest body of water entirely within the State, lies almost wholly within the town. The government is administered by town meetings, held annually and at special call. Pop., 1890, 2396; 1900, 2089; 1910, 1885.

CASTLETOWN, kās'l-toun. The ancient capital of the Isle of Man, situated on the margin of Castletown Bay, near the south extremity of the island (Map: England, B 2). In its midst rises Castle Rushen, a fortress of great strength, founded by Guthred II of the Orrys kings of Man, in 960. It was besieged by Robert Bruce in 1313 for about six months and almost completely destroyed. It is well built and has a few noteworthy public buildings, its chief educational institution being King William's College, an excellent school for boys. Being in the neighborhood of the bold coast scenery of the Calf of Man, Spanish Head, etc., Castletown is a favorite resort for the numerous tourists who frequent the Isle of Man. Pop., 1900, 2520; 1911, 3828. Consult Fitzgerald, "Castletown and its Owners," in *Kildare Archaeological Journal*, vol. ii (Dublin, 1898).

CASTLEWOOD, kās'l-wud, **COLONEL FRANCIS ESMOND, LORD.** The second Lord Castlewood in Thackeray's *Henry Esmond*, the father of Beatrix and Francis. He is a rollicking, hard-drinking spendthrift, who tires of his wife, spoils his children, leads a double life, and is killed in a duel with Lord Mohun.

CASTLEWOOD, LADY. Mother of Beatrix and Francis Esmond and wife of the second Lord Castlewood, in Thackeray's *Henry Esmond*. She becomes spiritually separated from her husband and children by her excessive goodness. At the close of the story she is married again to Henry Esmond, a cousin, who had been brought up in the Castlewood household and who had been long loved by her in secret.

CAS'TOR, TEMPLE OF. A temple on the south side of the Roman Forum, built at the Spring of Juturna, to commemorate the miraculous appearance of the Dioscuri to announce the victory of Lake Regillus in 496 B.C. The temple, of which the three remaining columns are among the most prominent remains in the Forum, was dedicated in 484 B.C. and reconstructed by Tiberius and dedicated again in 6 A.D. The last excavations, which completely freed the substructure on three sides, took place in 1901. It was used as a place of deposit for valuable articles and contained the standards of weights and measures. Consult Hülsen-Carter, *The Roman Forum*, pp. 151-154 (Rome, 1906).

CASTOR, ANTONIUS. A botanist of Rome, in the first century A.D., several times quoted and mentioned by Pliny. He had a botanical garden, probably the earliest on record.

CASTOR AND POLLUX (Gk. Κάστωρ, Καστώρ, and Πολυδεύκης, Polydeukēs). Twin gods of Greece and Rome, known under the name of Dioscuri (Lat., from Gk. Διόσκουροι, Dioskouroi, from Διός, Dios, of Zeus + κούρος, kouros, youth), i.e., children of Zeus and Leda, wife of Tyndareus, to whom the god came in the form of a swan. The Dioscuri were especially revered among the Dorians; their tomb was shown at Amyclæ, near Sparta. The Dorian divinities were later confused with similar twin brothers worshiped in other Greek states; hence we find a wide variety of functions ascribed to the Dioscuri. In general, they appear as saviors in time of need, whether in battle or at sea. In art they are usually represented with white horses, as in the fine group on Monte Cavallo in Rome. They often wear an egg-shaped cap in commemoration of their birth from the egg brought forth by Leda and are frequently crowned with stars and armed with lances. They appear as patrons of athletic sports—Castor of horsemanship and Pollux of boxing. Among their exploits were the invasion of Attica to rescue their sister Helen from Theseus; their part in the hunt of the Calydonian Boar; their participation in the Argonautic expedition; their abduction of the daughter of Leucippus; and, lastly, their battle with the sons of Aphareus, in which Castor (the mortal brother, son of Tyndareus) was slain by Idas and both the Apharidæ were killed by Pollux. Pollux, who was immortal, was allowed by Zeus to share his immortality with his brother, so that they sojourned one day in Hades and the next in Olympus. This is the version of the *Odyssey*, but later writers give other versions of the way in which this immortality was shared. The astronomical writers identify them with the zodiacal constellation of the Twins. (See GEMINI.) They were greatly venerated in Rome, where it was believed that at the battle of Lake Regillus they fought at the head of the Roman legions, and afterward, with incredible speed, carried to the city the news of the victory. Where they alighted, near a well in the Forum, a temple was built in their honor, and a great festival was held in their honor on the ides of Quintilis, the supposed anniversary of the battle. A part of the ceremonies was a grand muster of the equestrian body, when all the knights, clad in purple and crowned with olive, assembled at the temple of Mars, outside the city, and rode in state to the Forum.

The name Castor and Pollux was also given by sailors in classic times to twin balls of fire,

which attached themselves during thunderstorms to the masts of ships, and were considered to foretell fair weather. When only one ball of fire was seen, the meteor was called Helena and foreboded a storm. (See Shakespeare, *Tempest*, Act i, Scene 2. See ELMO'S FIRE, SAINT.) It was a favorable omen when the spears of the Roman armies were tipped with these lights. The Portuguese considered them as indicative of the presence of the body of Christ, whence they were called *Corposants* (compare *corpus sanctum*). Consult Albert, *Le culte de Castor et Pollux en Italie* (1883); Paton, *De Cultu Dioscurorum apud Græcos* (Bonn, 1894).

CASTOR AND POLLUX, HOUSE OF. The name given to a house at Pompeii, consisting of two distinct dwellings connected by a peristyle court, ornamented with frescoes, representing Castor and Pollux holding their horses by the bridles.

CASTOREUM (Lat., Gk. καστόριον, kastorion, castor, from Κάστωρ, kastōr, beaver). A substance secreted in two paired glandular sacs, closely connected with the organs of reproduction in both sexes of the beaver, and at one time held in high repute in medicine, although now chiefly used by perfumers, when any can be obtained for market from the disappearing animals. It was well known to the ancients. From the time of Hippocrates it was regarded as having a specific influence over the uterus, and was esteemed valuable in hysteria, catalepsy, and other spasmodic diseases. It has always been considered by trappers one of the most powerful of bait scents, under the name "barkstone."

CASTORIDÆ (Neo-Lat. nom pl., from Gk. κάστωρ, kastōr, beaver). The beaver family. See BEAVER.

CASTOR OIL (so called from its fancied resemblance to castoreum). A fixed oil expressed from the seeds of *Ricinus communis* (Linné), which is cultivated in India. In extracting the oil the seeds are first bruised between heavy rollers and then pressed in hempen bags under a hydraulic or screw press. The best variety of oil is thus obtained and is known as *cold-drawn* castor oil; but if the bruised and pressed seeds be afterward steamed or heated and again pressed, a second quality of oil is obtained, which is apt to become partially solid or frozen in cold weather. In either case the crude oil is heated with water to 212° F. (100° C.), which coagulates and separates the albumen and other impurities. Exposure to the sunlight bleaches the oil. When pure and cold-drawn, castor oil is of a light-yellow color; but when of an inferior quality, it has a greenish, and occasionally a brownish, tinge. It is somewhat thick and viscid. Its specific gravity is high for an oil, being about .960. It is miscible with alcohol and ether. Reduced to a temperature of -15° C., it becomes solid; exposed to the air, it very slowly becomes rancid, then dry and hard, and serves as a connecting link between the drying and nondrying oils. It has a faint odor and a bland or slightly acid, and to many persons sickening, taste, which may be overcome by the addition of a little magnesia. The principal acid present in it is ricinoleic acid, C₁₈H₃₄O₆, which is allied to oleic acid. It also contains palmitin, stearin, myristin, and an acid principle.

Castor oil is largely used in medicine and the arts. As a simple purgative it acts in about five hours and empties the large intestine. It will purge even if rubbed into the skin. Its

secondary effect is sedative and slightly constipating. It is not suited for continued or repeated use, but should be employed in an emergency, or occasionally, for a single result. It is very useful in diarrhœa due to eating indigestible or irritative substances, in the constipation of alcoholism as well as of pregnancy, and in inflammatory diseases of the kidneys or of the generative organs. It may be administered in orange juice, or flavored with oil of bitter almonds, or given in coffee or in soda water, or in soft, elastic capsules of gelatin.

Castor oil may be variously adulterated, with several of the fixed oils or even lard. The best test of its purity is complete solubility in its own volume of alcohol, a test which other fixed oils do not stand.

CASTOR-OIL PLANT, CASTOR BEAN, PALMA CHRISTI, *Ricinus communis*. A member of the order Euphorbiaceæ, a native of tropical Asia and Africa now naturalized in most tropical and subtropical countries, and cultivated also in temperate climates. In the warmer climates it is a perennial and occurs as a small tree, but it does not endure frost and becomes an annual in temperate regions. It was known to the ancient Egyptians and to the Romans. There are many distinct forms, generally all regarded as varieties of a single species, which differ in stature, shape, and color of the leaves, and are very popular for ornamental planting. The leaves are large and broad, from 1 to 2 feet or even more in diameter, and palmately cleft. The flowers are unisexual and are borne upon the same plant. The fruit is a spiny capsule containing one seed in each of its three divisions. The seeds are oval, from one-third to one-half inch long, and often beautifully variegated. They are chiefly valued for the oil they yield, the common castor oil so generally used as a purgative, and also for lighting and lubricating purposes. The plant is cultivated for this oil in the United States, mainly in localities of Kansas, Oklahoma, Illinois, and Missouri, and in southern Europe, Asia, South America, the West Indies, and other tropical and warm temperate countries. The United States also imports seed, mainly from India, for the manufacture of the oil. A bushel of beans yields about two gallons of oil. The pomace which remains after the oil has been extracted from the seed is a valuable fertilizer, but is not used for feeding purposes on account of its poisonous character. British India, the principal producing country, exports over 3,000,000 bushels of the beans and over 2,000,000 gallons of the oil annually (*United States Department of Agriculture Yearbook, 1904*). For illustration, see Plate of CALABASH, ETC.

CAS'TRALEU'CUS. See CASTELLO BRANCO.

CASTRATION (Fr., Lat. *castratio*, from *castrare*, to emasculate; Skt. *śastra*, knife). The removal of the essential organs of generation in animals. In males castration consists in taking away the testicles. In females castration or spaying consists in removing the ovaries. The purpose of castration is, generally, to make domestic animals more docile and more valuable for meat as well as to restrict reproduction. These advantages are counterbalanced, at least in part, by the fact that castration diminishes the powers of endurance and lowers the intelligence. Castration may be performed at almost any age, but the effects of it are more pronounced if it is performed before the age

of puberty. In surgery castration is sometimes rendered necessary by disease of the testicle. In the female the operation is known as oöphorectomy. See EUNUCH.

CASTRÉN, kâ-strän', MATTHIAS ALEXANDER (1813-52). An eminent Finnish philologist. He was born at Tervola, Dec. 2, 1813, received his earliest instruction in the town of Torneå, and afterward studied at Helsingfors, where his dissertation *De Affinitate Declinationum in Lingua Fennica, Esthonica et Lapponica* (1839) won him the title of docent. About the year 1838 he undertook a pedestrian excursion through Finnish Lapland, in order to extend his knowledge of the language and literature, and in 1840 another through Karelia, to collect ballads, legends, etc., illustrative of Finnish mythology. On his return he published, in Swedish, a translation of the famous Finnish poem, "Kalevala," the metre and style of which were imitated by Longfellow in his poem of "Hiawatha." Aided by the government of his native province, he commenced his researches among the Finnish, Norwegian, and Russian Laplanders, as also among the European and Siberian Samoyeds. Appointed linguist and ethnographer to the St. Petersburg Academy, Castrén, between the years 1845 and 1849, prosecuted his laborious investigations as far east as China and as far north as the Arctic Ocean. On his return he was appointed first professor of the Finnish language and literature at the University of Helsingfors, and in 1851 became chancellor. He employed himself in preparing for publication the vast materials which he had collected, but died, May 7, 1852, from exhaustion—a martyr to science. Before his death appeared *Versuch einer ostjakischen Sprachlehre nebst kurzem Wörterverzeichnis* (1849), as the first installment of his *Nordiska Resor och Forskningar* ('Northern Travels and Researches'). Other works published by him are: *Elementa Grammatices Syrjaenæ* (1844) and *Elementa Grammatices Tscheremissæ* (1845); *Vom Einfluss des Accents in der Lappländischen Sprache* (1845); *De Affinis Personalibus Linguarum Altaicarum* (1850). An edition of his works in Swedish, in 5 vols., appeared in 1852-58, and was supplemented in 1870 by another volume containing a *Biography* of Castrén by I. V. Snellman; a German translation was published between 1853 and 1862, under the auspices of the Academy of St. Petersburg, by Anton Schiefner. They include, besides the works above enumerated, grammars of the Samoyed, Buryat, Tungus, Ostyak, and Koibalic languages.

CASTRES, kâs'tr'. A town of France, in the Department of Tarn, situated in the fertile valley on both sides of the river Agout, 24 miles east of Toulouse (Map: France, S., G 5). The principal features are the cathedral, the seminary, the communal college, the public library, and the artillery school. The western half of the town is traversed by wide boulevards and an aqueduct hewn in the solid rock. It is famed for its manufactures. Its fine dyed-wool goods are especially famous, and it has also manufactures of silk, linen, leather, paper, soap, earthenware, metal, furniture, and dyestuffs. Pop. (commune), 1901, 27,308; 1911, 27,830. In the Middle Ages Castres was founded by the Benedictines. In 1519 it was incorporated in the crown of Francis I, and was one of the first French towns to adopt Calvinistic doctrines. It is the seat of a Protestant consistory. It suf-

ferred heavily during the religious wars of the sixteenth century, and in 1629 Louis XIII razed its fortifications.

CASTRI, kă'strē, or **KASTRI**. A village of modern Greece, in the Nome of Phocis, on the southern declivity of Mount Parnassus, worthy of notice as formerly occupying a portion of the site of Delphi (q.v.). Since the French purchased the site to excavate Delphi, the inhabitants moved in 1893 to the new village, somewhat to the west.

CASTRIES, kă'strē', or **PORT CASTRIES**. The capital of the island of St. Lucia, West Indies (Map: West Indies, G 4), 300 miles southeast of Porto Rico. It is situated on the west coast, on Carenage Bay, the entrance to which is marked by a lighthouse visible 14 miles. Most of the trade of St. Lucia, in cocoa, coffee, sugar, rum, mahogany, logs, fruits, and timber, is carried on through this port. Pop., in 1903, 7757.

CASTRIOTA, kăs'trē-ō'tā, **GEORGE**. See **SCANDERBEG**.

CASTRO, kă'strō, **CIPRIANO** (1861-1924). Ex-President of Venezuela. He was born near San Antonio in the Andean Province of Tachira. Little is known of his early life except that, after having been elected a senator from his state, he withdrew from Carácas when President Palacio fell in 1892. The year 1899 brings him to the attention of the public as leader of an insurrection against President Andrade. By some military successes and much bribery Andrade's supporters were soon won from him, and Castro entered Carácas the same year. In 1900 he was chosen provisional President, and in 1901 was formally elected for the balance of Andrade's constitutional term of six years. From the beginning of his rule the country hardly knew a moment of peace. The most important of the insurrections was that headed by Matos in 1902-03. Castro involved his country in dangerous quarrels abroad; the most important being those with the European creditor nations (1902-03), with the United States (1904-), with Colombia and France (1905). In the handling of these difficulties Castro exhibited an utterly unscrupulous shrewdness. In 1905 he was unanimously reelected for a full term, and in honor of the occasion a general amnesty for all political offenders was proclaimed. Congress conferred upon him at the same time the title of "Restaurador de Venezuela." Meanwhile, since 1904, there had been difficulty with the United States because of the confiscation, under suspicious circumstances, of the properties of the New York and Bermúdez Asphalt Company. In 1907 Castro had to deal with two serious rebellions, which he quelled by sweeping executions of the leaders and those closest to them in the plots. Difficulties with most of the foreign creditor powers continued, although in July of 1907 Venezuela met her obligations with British, German, and Italian creditors, as per The Hague Tribunal awards, while refusing to pay the Belgian award. Under Castro's instigation there was further trouble between Venezuela and the New York and Bermúdez Asphalt Company. An appeal by the company to the Venezuelan Supreme Court brought a verdict unfavorable to the company; but the verdict was so manifestly not in accordance with the facts presented that the State Department of the United States, recognizing that the Venezuelan Supreme Court was composed of judges appointed by and removable at pleasure by Castro himself, made

representations concerning the matter to the government of Venezuela. Castro held out, but in December, 1908, went to Europe to undergo a surgical operation. Shortly thereafter the dissatisfaction with him and his rule came to a head in the bloodless revolution that placed Vice President Juan Vicente Gómez in the presidency. Gómez reversed Castro's policy; the New York and Bermúdez Asphalt Company's case was settled by agreement and the company's property restored to it, and the disagreements with the Netherlands and France, which Castro had managed with a high hand, were placed by Gómez in a fair way for settlement. Castro made repeated attempts to return to Venezuela via various countries, but through 1913 had been unsuccessful.

CASTRO, INEZ DE (?-1355). A Spanish noblewoman whose unhappy fate has been made the subject of tragedies and poems. She was the daughter of Pedro Fernandez de Castro, a descendant of the royal family of Castile. After 1340 Inez lived with her cousin, Constantia, the betrothed wife of Dom Pedro, son of Alfonso the Proud of Portugal. Constantia died in 1345, and Dom Pedro, as she afterward claimed, secretly married Inez in 1354, in the presence of the Archbishop of Guarda. As the King feared that this union might prove injurious to the claims of Ferdinand, son of the deceased Constantia, it was determined in the King's Council that Inez must die. Accordingly, the King with three companions hastened to Coimbra to execute the sentence (1355); the King was so moved by the grief of Inez that he wished to spare her, but his companions murdered her. Dom Pedro attempted a revolt against his father, but finally became reconciled. According to a tradition, immortalized by Camoens, Pedro, who had succeeded his father, established the legality of his marriage with Inez, caused her body to be exhumed, and, placing it upon the throne, required all the nobles to do her homage.

CASTRO, João de (1500-48). A Portuguese naval commander and explorer. He was born in Lisbon and as a youth distinguished himself in a number of campaigns against the Moors of Tangiers and Tunis. Upon his return from an expedition to the Red Sea, he was made, in 1543, commander of a fleet to clear the European seas of pirates. In 1545 he was sent out as Viceroy of the Indies to supplant Martin de Souza. He overthrew Mahmud, King of Cambodia, relieved the beleaguered town of Diu, and defeated the great army of Adhel Khan. He subsequently completed the subjugation of Malacca and prepared the way for the invasion of Ceylon. Shortly after receiving his full commission as Viceroy he died at Ormus. He wrote a description of the Red Sea entitled the *Roteiro*, which was very important for his day (latest ed. by Corvo, Lisbon, 1882). Aside from Vasco da Gama, João de Castro is the only one of those illustrious captains sent by Portugal to India to whom a statue has been erected. It stands over the gate of the principal entrance to Goa.

CASTRO, José María (1818-93). A statesman of Costa Rica, born in San José. He graduated at the University of León, Nicaragua. He was President of Costa Rica from 1847 to 1849. He had always shown an intense interest in educational affairs, and it was he who proposed and obtained, while he was Minister under José María Alfaro, the creation of the University of Santo Tomás. One of his earliest acts as

President was the founding of a normal school, for the purpose of establishing later girls' schools throughout the country. During his administration he suppressed various rebellions and showed himself element under extreme provocation, for he never resorted to the death penalty against his political foes. During this administration, too, the position of "City Physician" was created in all the provinces, and local charitable bureaus were inaugurated. He established the independence of Costa Rica from the Federation of Central American States, although remaining on friendly terms with the neighboring states. He established also diplomatic relations with foreign countries. For these services Congress on separate occasions voted him the following titles, "Benemérito ('Well-Deserving') de la República," "Commander in Chief of the Army"; and, when he resigned the presidency, Nov. 16, 1849, the Congress conferred upon him the title of "Founder of the Republic of Costa Rica." He was again President from 1866 to 1868, when he was superseded by Jiménez. Consult F. Montero Barantes, *Historia de Costa Rica* (San José de Costa Rica, 1892 et seq.).

CASTRO ANDRADE Y PORTUGAL, ándri'dá è pór'too-gál', PEDRO ANTONIO FERNÁNDEZ DE, tenth COUNT OF LEMOS and seventh MARQUIS OF SARRIÁ (1634-72). A viceroy of Peru, grandee of Spain, and son of the patron of Cervantes. He was appointed to succeed the recently deceased (March, 1666) Count of Santistevan, Diego Benavides y de la Cueva, and entered upon his office on Nov. 21, 1667. The lawlessness in the mining regions he met with severity. Particularly was this true in connection with the silver mine of one Gaspar de Salcedo at Laycacota, near Lake Titicaca. The enormous revenues derived by Salcedo from this mine angered other mining proprietors of the district. Bushwhacking bands were formed, and blood flowed freely. The Viceroy opened at Pan-car-colla a court for the trial of such offenses, executed 42 persons, and banished or fined many more. Having been assured by his confessor, Francisco del Castillo, that he had been needlessly cruel, he had masses said for the souls of his victims, and himself performed menial duties in the conduct of the services. While engaged in these devotional exercises, he was seized with a dangerous illness that caused his death, Dec. 6, 1672.

CASTRO DEL RIO, ká'strò dël rē'ò (Sp., castle of the river). A town of Spain, in the Province of Córdoba, situated on the right bank of the Guadajoz, about 21 miles southeast of Córdoba (Map: Spain, C 4). A portion of the old town is surrounded by ruined walls. In earlier times the city wall had only one gate, defended by a Moorish castle, which the Count of Castro and his followers repaired and used in the turbulent days of Henry IV (1425-74). The new town, lying outside of these, has some good streets. The municipal building is worthy of mention. The town has manufactures of woolen and linen fabrics, earthenware, etc., and carries on considerable trade in agricultural produce. Pop., 1900, 11,689; 1910, 11,734.

CASTROGIOVANNI, ká'strò-jò-vā'n'ns (It., castle of John). A city in the Province of Caltanissetta, Sicily, situated on the level top of a hill 2600 feet high, 55 miles west of Catania (Map: Italy, J 10). From the highest tower of the citadel La Rocca, which occupies the

highest part of the town, is obtained one of the finest views in Sicily. The cathedral, founded in 1307, has some treasures, and the public library contains valuable incunabula. There are also a museum, a technical institute, and a castle built by Frederick II of Aragon. The city is a local centre of trade, mainly in sulphur and rock salt. It occupies the site of the ancient Enna, called *inexpugnabilis* by Livy, and the modern name comes through the Arabic *Kasr-Yani*, the *Yani* being an Arabic corruption of *Enna*. In the Punic Wars Enna was a centre of combat, and ancient Roman missiles are still picked up in the vicinity. In 837 A.D. its walls defended the inhabitants of the whole district against the Saracens, but in 859 the fortress was captured by treachery. The Normans captured it in 1087. Pop., 1901, 26,081; 1911, 28,932.

CASTRO-URDIALES, -oor'dé-sí'lás. A town of Spain, in the Province of Santander, situated on the Bay of Biscay (Map: Spain, D 1). It has a good roadstead and exports timber and fish to Madrid. Fishing and fish preserving, with some manufactures, constitute the principal industries. The town, after having repelled a previous attack, was sacked by the French in 1813. Pop., 1900, 13,068; 1910, 12,463.

CASTROVILLARI, ká'strò-vèl-lá'rè. A city in south Italy, 34 miles north of Cosenza, on the Coscile (Map: Italy, K 8). The ancient part of the town, about the Norman castle, is not inhabited because of the prevalence of malaria. Near by at Lungro are the only important salt mines of Italy. Fruit, wine, and cotton are marketed here. Pop., 1901, 9945; 1911, 9700.

CASTRO Y BELLVIS, è bəl'vəs, GUILLEM DE (1569-1631). A Spanish dramatist, the most brilliant writer in the so-called Valencian school. He was born of an exceedingly distinguished Valencian family, and enjoyed the friendship of many celebrated and powerful personages in society, in letters, and in statecraft. In 1591 he became a member of a local literary academy called the *Academia de los Nocturnos*. Already in 1593 we find him as captain of the coast guards of Valencia, a position that he seems to have held at least throughout the rest of the century. In 1602 he carried off a first prize in a literary tournament held in Valencia in honor of the canonization of the Catalan Fray Raymundo de Peñafort. Later he was the protégé of Juan Alonso Pimentel de Herrera, Count of Benavente, Viceroy and captain general of Naples, 1603-09, who in 1607 appointed him to the governorship of Scigliano. Still later in his career he was handsomely favored by the Duke of Osuna and by Olivares. In 1619 Lope de Vega, with whom he had long been on terms of intimate friendship, dedicated to him a famous play, *Las almenas de Toro*, while Castro had already dedicated to Lope's daughter the part of his *Comedias* (1618-21). In 1620 we find Castro at Madrid taking part in a literary tournament in honor of the beatification of San Isidro. The following year he again appears at court in a poetic tournament held in honor of the canonization of St. Ignatius Loyola and St. Francis Xavier. In 1622 the patron saint of Madrid, San Isidro, was canonized, and in the literary contest held in honor thereof, Guillem de Castro won a first prize. At this time he seems to have remained in Madrid, and on Aug. 22, 1623, there was conferred upon him the habit of the Order of Santiago. Some writers

have stated that for his waywardness he lost his powerful protectors, and that he died so poor that he had to be buried at public expense. There seems to be no foundation for this report. His will, dated three days before his death on July 28, 1631, has been found, and it disposes of a comfortable fortune. Castro's *Fuerza de la costumbre* is considered by some the source of *Love's Care*, which has been ascribed to Fletcher. Castro is said also to be the author of *El prodigio de los montes*, whence Calderón derived his *Mágico prodigioso*; but it is possible that the *Prodigio* is only another name for Lope de Vega's play *La bárbara del cielo*. Castro's most celebrated play is his *Mocedades del Cid*, from which Corneille confessedly derived his own *Le Cid*. Seven of his plays are to be found in vol. xliii of the *Biblioteca de autores españoles*. Consult: *Las mocedades del Cid* (ed. of W. Foerster, Bonn, 1878); *Première partie des mocedades del Cid* (ed. of E. Mérimée, Toulouse, 1890); *Ingratitud por amor* (ed. of H. A. Rennert, Philadelphia, 1899); *Comedia del pobre honrado* (ed. of M. Serrano y Sanz, in *Bulletin Hispanique*, vol. iv, 1902); *El ayo de su hijo* (ed. of H. Mérimée, in *Bulletin Hispanique*, vols. viii, ix, and xi, 1907-09); of all these editions of single plays only those by the two Mérimées and Rennert contain good introductions. Consult also C. Pérez Pastor, *Bibliografía Madrileña*, part iii, pp. 344-362; and for a biography and bibliography, with justificatory documents, consult the *Cancionero de la Academia de los Nocturnos de Valencia*, extracted from the *Actas* of the Academy by Pedro Salvá, and Francisco Martí Grajales, in 3 vols. (Valencia, 1905-06).

CASTRUCCIO CASTRACANI, kâ-strôot'chô kâ'strâ-kâ'né (c.1280-1328). An Italian soldier and Ghibelline leader, Duke of Lucca. A member of a prominent Ghibelline family of Lucca, he was exiled at an early age and served as a soldier in Flanders and Lombardy until 1314, when he conquered Lucca. Being placed at the head of his state, he played a prominent rôle in the struggle between the Ghibellines and Guelphs in Tuscany. He supported the German Emperor, Louis the Bavarian, whom he accompanied on his expedition to Rome in 1327, and who made him Imperial vicar of Lucca and master of Pisa. Machiavelli's life of Castruccio is untrustworthy. Consult Winkler, *Castruccio, Herzog von Lucca* (Berlin, 1897).

CASTRUM CERRUCIUM. See CASTEL-SARRASIN.

CAST STEEL. See IRON AND STEEL, METALLURGY OF.

CASTUA, kâ'stwâ. A town in the Austrian Crownland of Istria, at the head of the Bay of Quarnero, near Fiume (Map: Austria, D 4). Pop. (commune), 1900, 18,000, mostly Serbo-Croatian. Castua, being a very old town, is noted solely for its former glories, when it was the capital of Liburnia. The ancient walls, towers, and a Roman aqueduct still remain.

CASUAL POOR. A term used in the administration of the English Poor Law to indicate persons temporarily relieved without being admitted to the roll of permanent paupers. See POOR LAWS.

CASUARINA, kâzh'tâ-â-rî'nâ (Neo-Lat., from *casuarinus*, cassowary, from Dutch *kasuaar*, Malay, *kassuvaris*, so called from the resemblance of the branches to the feathers of the bird). A genus of the family Casuarinaceæ. The trees of this genus are almost exclusively Australian.

However, *Casuarina equisetifolia* is found in the South Sea Islands, the Indian Archipelago, the Malayan Peninsula, and on the east side of the Bay of Bengal, as far north as Arracan, and *Casuarina sumatrana* grows in the Philippine Islands. Some of them are large trees, producing timber of excellent quality, hard and heavy, as the beefwood of the Australian colonists, so called from the resemblance in color to raw beef. *Casuarina equisetifolia* is called in Australia the swamp oak. It is a lofty tree, attaining a height of 150 feet, the *toa* or *aitoa* of the Society Islands, where it grows chiefly on the sides of hills, and where its wood was formerly used for clubs and other implements of war. It has been introduced into India, where it grows rapidly upon even poor, sandy soil, and where it is much valued, as its wood bears a great strain and is not readily injured by submersion in water. The hardness and durability of this wood led the earlier voyagers to the South Sea Islands to designate it ironwood. *Casuarina stricta* is the "coast she-oak" of New South Wales. In Australia, where the Casuarinas abound, they are considered among the most valuable trees. For the most part the wood is hard, compact, yet easily worked, and is used in many kinds of building, for implements, cabinetwork, etc. The foliage of most, if not all, species is of an acid nature and is often chewed to allay thirst. In periods of drought stock eat considerable quantities of the foliage. The first-mentioned species has been quite successfully introduced into parts of Florida and California. "Cassowary tree" is a popular generic name of the Casuarinas. Some of the species are scrubby bushes. All of them have a very peculiar appearance, their branches being long, slender, wiry, drooping, green, and jointed, with very small scalelike sheaths instead of leaves. They resemble arborescent equisetums, or horsetail rushes. The fruit consists of hardened bracts, collected in a cone and inclosing small winged nuts. The flowers have neither calyx nor corolla; the stamens and pistils are on separate flowers. About 25 species are known. This genus is noteworthy as the first one in which chalazogamy (q.v.) was found.

CASUISTRY, kâzh'tâ-is-trî (from *casuist*, Fr. *casuiste*, from Lat. *casus*, instance). A punctilious elaboration of a system of rules for the guidance of conscience, so that each particular action can be brought under some rule. That part of theology which deals with such matters is called moral theology. Casuistry developed as circumstances called for new and clearer interpretations of divine and human enactments. In the first centuries it was extremely simple, and the treatises on it consisted mainly of conciliar decrees, or collections of penitential canons such as those attributed to St. Gregory Thaumaturgus, St. Peter of Alexandria, St. Basil, and St. Gregory of Nyssa. From the seventh to the eleventh century the work known as *The Penitential Book*, which was a digest of canons, sentences, and decrees, was the manual commonly used. But moral theology proper began with the schoolmen of the thirteenth century. The most noteworthy of the treatises then written was the *Summa de Casibus Particularibus* (c.1238), of St. Raymond of Peñafort. Other conspicuous casuists of the century were the Englishman Alexander of Hales, and Vincent of Beauvais. In the fourteenth century we have John of Freiburg, Astensis, Monal-

dus, Bartholomæus, Ranulphus Higdenus, and, most famous of all, Joannes de Burgo. In the fifteenth century Gerson's famous *Opusculum Tripartitum* enjoyed the greatest reputation. St. Bernardine of Siena, St. John Capistran, and St. Antoninus also wrote on moral subjects. But the one who has exercised the widest influence is, of course, St. Thomas Aquinas (1227-74), who in his *Secunda Secundæ* treats of moral theology in its organic connection with dogma. Its technical character, however, makes it somewhat unavailable as a manual for common use. Making this science practical was the achievement of the sixteenth century. The extraordinary development of this particular branch of theological knowledge was largely due to the doctrine of Probabilism.

This was not a new doctrine, but it was inaugurated as a system by a Spanish Dominican named Medina. The theory may be thus stated: A man in doubt about the lawfulness of an act has solid reasons for thinking it is lawful. These reasons may be intrinsic to the matter itself, or extrinsic, namely, the authority of some respectable theologian. But there may be contrary reasons of equal or greater weight than those in favor of it. Which course is he to elect? Probabilism teaches that he is free to do as he chooses, provided his reasons for acting be genuine and solid. He proceeds on the principle that, as the law is not certain, he is free; for no one is bound by a doubtful obligation. This liberty, however, is restricted if for some major obligation he is bound to take every reasonable means to achieve a certain object. A hunter may not discharge his rifle where it is merely probable no one will be hit; he must take every reasonable precaution; a Catholic priest may not act on the doctrine of probability where there is question of the validity of a sacrament. But apart from these antecedent obligations of justice, charity, and religion, Probabilism leaves a man free when he has good reasons for judging that he is doing right.

In the development of this casuistry four schools arose: the Tutorists or Rigorists, who were either absolute or mitigated—the former requiring absolute certainty, the latter the greatest probability; the Probabiliorists, who taught that in cases of doubt a man should always follow the safer course; the *Æquiprobabilists*, who allowed liberty of action only when the reasons *pro* and *con* were evenly balanced, but modified that concession by saying that when the existence of the law was certain or even more probable, there could be no liberty against it, for the law being certainly or more probably in possession exacted fulfillment; the Laxists, who contended that one is free to act if he has even a slight reason to conclude that he is in the right. The Laxists were condemned by Innocent XI, and the Absolute Tutorists by Alexander VII.

On these lines a fierce and protracted theological battle began, which finally narrowed down to a contest between the Probabiliorists and the Probabilists. From 1580 to 1650 Probabilism held possession. After that a reaction set in, and Probabiliorism was the favorite doctrine. At present the conditions have reverted to what they were in the beginning, and Probabilism almost everywhere prevails in the Roman Catholic church. The chief exponents are St. Alphonsus Liguori, Scavini, Gury, and Ballerini.

The acrimony of these debates gave rise to

the odious significations which have been affixed to the word "casuistry." After the accusations of the Jansenists (see PASCAL; JANSENISM) ceased, about the middle of the eighteenth century, many Protestant writers took them up and denounced the casuistry of Probabilism as lax, equivocating, permitting the most detestable crimes, and outraging the most sacred obligations. These charges, no longer seriously made by intelligent students, have given rise to the secondary meaning of the word "casuistry" as, according to some, a method of oversubtle, sophistical, and dishonest reasoning for the purpose of evading the law; others regard it as an elimination of individual reason and conscience and a blind submission to authority. Consult: Düllinger and Reusel, *Moralstreitigkeiten im siebzehnten Jahrhundert* (1889); Slater, *Cases of Conscience for English-Speaking Countries* (New York, 1911); also works on Ethics under ETHICS. See PROBABILISM.

CASUS BELLI (Lat., case of war). The ground alleged by one power to justify its going to war with another. The grounds which in international law are recognized as affording a justification for war are: (a) the defense of the sovereignty and independence of the state; (b) the redress of grave injuries inflicted by a foreign power on the citizens of a state; (c) to obtain satisfaction for violations of the honor of a state, as for insults to its flag or its ambassadors; (d) the enforcement in serious cases of treaty obligations; (e) the prevention of threatened or intended injury, as a sudden disturbance of the balance of power in Europe, or the disregard by a European power of the Monroe Doctrine of the United States; (f) in rare cases, the prevention of flagrant wrong against religion or liberty, or grave oppression of a colony or weaker state, as in the war of the United States against Spain for the liberation of Cuba. (See INTERVENTION.) The most frequent cause of war, the desire of a state to further its own interests, is not recognized by international law as a legitimate *casus belli*. The humane tendencies of modern international law seek to restrict the causes for war, and by moral pressure to induce an offended state patiently to seek every other means of effecting its object before resorting to the dire expedient of war. See INTERNATIONAL LAW; HAGUE PEACE CONFERENCE; WAR, and the authorities there referred to.

CASWELL, káz'wel, ALEXIS (1799-1877). An American educator. He was born in Taunton, Mass., graduated at Brown University in 1822, and entered the Baptist ministry. He was professor of mathematics and natural philosophy in Brown University from 1828 to 1850 and of mathematics and astronomy from 1850 to 1864 and was president of that institution from 1868 to 1872. He was, besides, one of the founders of the American Association for the Advancement of Science. Besides a *Life of Francis Wayland* and a *Textbook on Astronomy*, he published several papers on meteorology in the *Reports of the Smithsonian Institution* and a *Memorial of John Barstow* (1864).

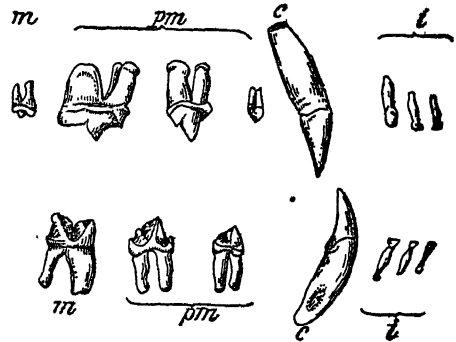
CASWELL, RICHARD (1729-89). A patriot soldier of the American Revolution and the first Governor of the State of North Carolina. He was born in Maryland, emigrated to North Carolina in 1746, studied and practiced law, and soon became prominent in Colonial politics. He was a member of the Colonial Assembly from

1754 to 1771, and was elected Speaker of the House of Commons in 1770 and 1771. He also attained prominence as an officer in the Colonial militia, and on May 16, 1771, commanded the right wing of Governor Tryon's forces in the battle of Alamance against the insurrectionary Regulators. He was active as a member of the Whig, or Patriot, party in the discussion which preceded the Revolution, and in 1774 and 1775 was a delegate to the Continental Congress. In September, 1775, he was appointed one of the treasurers of North Carolina. He commanded the minutemen, numbering about 1000, who, on Feb. 27, 1776, defeated a force of Loyalists, mostly Scotch emigrants, under Donald Macdonald, at Moore's Creek, N. C.; and for this victory, the effect of which, says Fiske, "was as contagious as that of Lexington had been in New England" (Fiske, *The American Revolution*, vol. i, p. 177), he was appointed brigadier general of the Newbern district. In 1776 he was a member of the committee of the Provincial Congress which drew up the State constitution—one tradition attributing the authorship of that document altogether to him—and in 1777-79 he served as Governor. In 1780 he commanded the North Carolina militia during the invasion of the State by the British and took part in the battle of Camden on August 16. He afterward served as Speaker of the State Senate and Controller General from 1782 to 1785, and as Governor, for a second term, in 1784-87, and in 1789 was a member of the State convention which ratified the Federal Constitution.

CAT (AS. *catt*, Ger. *Katze*, Fr. *chat*, OF. *cat*, It. *gatto*, Sp., Portug. *gato*, Welsh, *cath*, Corn. *cath*, Ir., Gael. *cat*, OChurch Slav. *koteli*, OPruss. *catto*, cat, Lat. *catus*, cub; borrowed in Finn. *katti*, Turk. *gadi*, Ar. *qitt*, *qutt*, Hind. *katus*; of uncertain origin). The cats are typical *eluroid* carnivores, constituting the family Felidæ, and well represented by the ubiquitous house cat, which is considered at length below.

Cats in general, as a family, are distinguished among carnivores by their uniformity of structure, by the flexibility and strength of the spine, the small head, capable of being turned in any direction, the looseness of the skin, and the exceeding suppleness, quickness, and muscu-

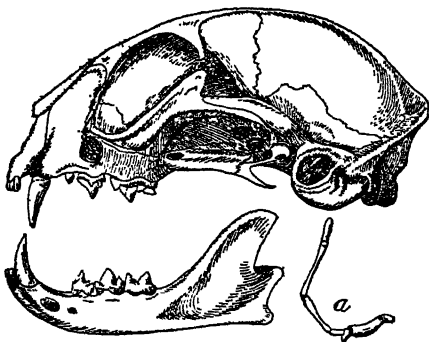
claws, and a crushing bite. All the anatomy, therefore, represents agility and power in the highest degree; and all cats except two or three of the heaviest (lion, tiger) are arboreal to a greater or less degree. The skull is remarkable for the bony ridges which give attachment



DENTITION OF THE CAT.

Teeth of left side in both jaws: *m* *m*, molars; *pm* *pm*, premolars; *c*, canines; *i*, incisors.

to the great jaw muscles, the immense size of which causes a corresponding increase in the width of the zygomatic arches; and the facial portion, short in all carnivora as compared with herbivora, is here much shorter than in the dog or bear tribes, giving the characteristic roundness to the head. The lower jaw is strongly attached, and capable only of a simple hingelike motion. The dentition consists of six small incisors in each jaw, large canines and one permanent molar on each side, that in the upper jaw being small, the lower large and acting against the fully developed premolar in the upper. All are carnassial, for little "grinding" of the food is called for; and the canines of some, as especially of the extinct sabre-toothed tiger, are formidable tusks. The tongue is rough; the intestinal canal very short, being in some species only three times the length of the body. The most striking and characteristic peculiarity of cat structure, however (though imperfect in one genus—*Cynalurus*; see CHEETA), is the arrangement for the protrusion and retraction of the claws, by which they are made the principal instruments whereby these creatures get their living. Their plan, as has been said, is to get as near as possible to their animal prey, seize and hold it until they can overcome it by biting through the arteries of the neck (in the case of large quadrupeds) or otherwise put it to death; they cannot chase it down and worry it to death after the manner of dogs. This requires that their toes should be separated, flexible, and capable of a powerful grip, and their claws sharp and hooked. The acquirement of such tools has been accompanied by provision for keeping them out of the animal's way, in the ordinary use of its feet, and at the same time saving them from becoming blunted by contact with the ground, as happens to those of all other clawed animals, by a peculiar arrangement. In the cats, the last (third) phalanx, or tip bone, of the toe, which carries the claw, does not touch the ground, but it is so modified as to turn up beneath a hood of skin over the end of the bone (second phalanx) next behind it; this it does naturally, when at rest, by virtue of the elasticity of a ligament which passes from

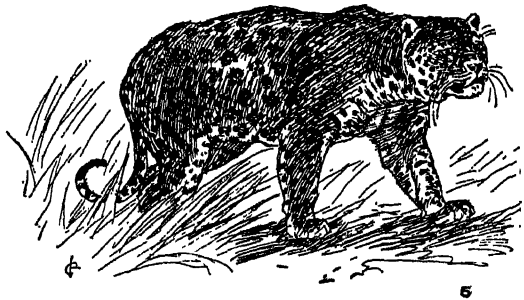
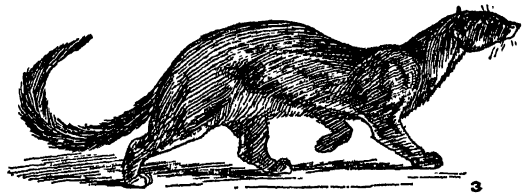
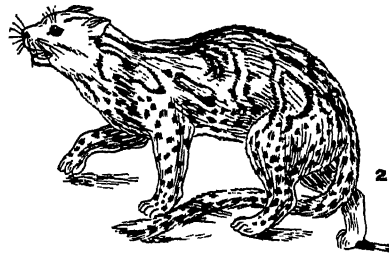


SKULL OF CAT.

a, tongue bones of one side.

larity, the last especially exhibited in the jaws and in the wonderful arrangement of levers in the limbs. These are correlated with their predatory habits and manner of procuring their prey, which is by lying in wait, or by stealthy approach, followed by a spring, a clutch of the

WILD CATS



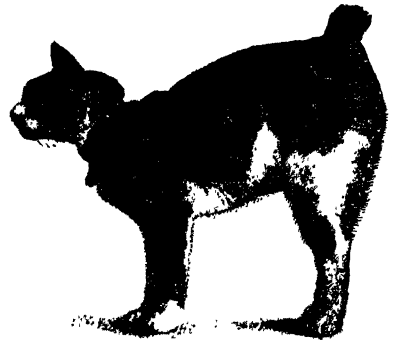
1. JUNGLE CAT OR CHAUS (*Felis chaus*).
2. MARBLED TIGER-CAT (*Felis marmorata*).
3. EYRA (*Felis eyra*).

4. HUNTING CAT OR CHEETA (*Cynaelurus jubatus*).
5. JAGUAR (*Felis onca*).
6. OUNCE OR SNOW LEOPARD (*Felis uncia*).

CATS



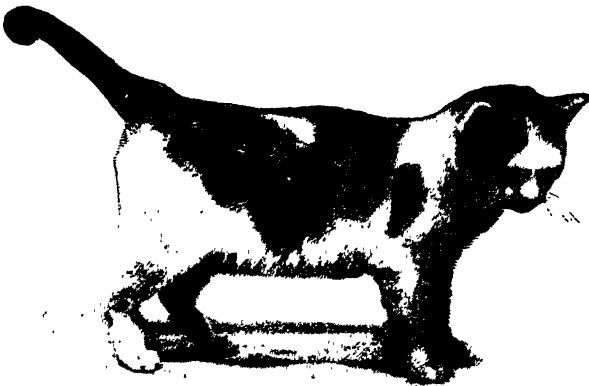
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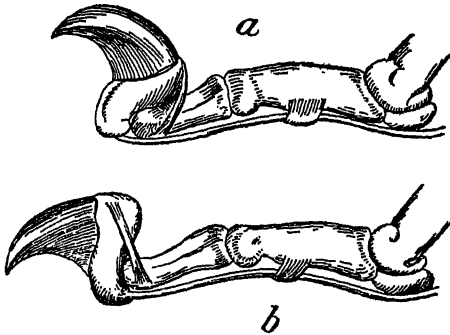


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1. EGYPTIAN OR CAFFRE CAT.
2. MANX CAT.

3. TORTOISE SHELL CAT.
4. BROWN TABBY CAT.
5. LONG-HAIRED, SILVER-HAIRED, OR ANGORA CAT.

it down to the second phalanx and holds it in place without any conscious effort. From the lower (proximal) end of this claw bone a powerful flexor tendon runs back beneath the bones of the toe to the leg muscles, the contraction of which pulls the claw down with a circular motion which drives it and hooks it into the flesh, where it will tear loose before it will let go. Such



MECHANISM OF CAT'S CLAWS.

a, Toe at rest (claw sheathed); b, toe in action (claw thrown forward). The illustration shows the elastic ligament which passes from above the root of the claw downward and backward to the distal part of the second phalanx; also the long flexor tendon (which by being pulled backward draws down the claw) passing through the ligamentous loop attached to the under surface of the middle phalanx. The sesamoid bone beneath the distal end of the metacarpal is also shown. (After Mivart.)

is the mechanism of the action so familiar and effective in the cat when she is angry and "shows her claws." The cheeta (*c.v.*) lacks this power, and correspondingly its predatory habits partake of much that characterizes dogs.

Cats are mainly nocturnal in their habits, and the pupils of their eyes, which, as a rule, are vertically linear, are capable of great expansion and contraction, according to the light about them; the lion, however, by virtue of his fearlessness and circumstances generally, is mainly diurnal and has round pupils. The eyesight is good, but at night is supplemented by the highly sensitive feelers (*vibrissæ*), long hairs projecting from the muzzle and above the eyes, each springing from a follicle from which a special nerve communicates with the brain. The sense of smell, though fairly developed, is inferior to that of dogs and various other animals. The hearing, however, is exceedingly sharp, the resonance of the sound being increased by the great size of the auditory bulla.

Cats are clothed in soft and usually rather long fur, longest in those, such as the ounce, or snow leopard, which live in cold regions, and shortest in the desert species, especially in the lion, which is further distinguished by a mane in the male sex. Little difference, as a rule, obtains between the sexes in size or appearance; but the kittens are often unlike their parents. Their pelts have never entered largely into the fur trade, however, except in the form of tiger-skin floor rugs, etc. The colors are mainly dark, with a prevalence of reddish or yellowish, and there is a universal and strong tendency towards spottedness (of which striping is another form), the young showing it even where the adult is concolorous, as in the lion, puma, eyra, etc. Arguments have been freely adduced for the value of this coloration in making the cats unnoticeable, but when it is learned that species almost oppositely colored and

marked live and hunt under identical circumstances with apparently equal success, the force of the speculation is seriously diminished.

Cats are not gregarious or coöperative, but live and hunt alone or in family parties; all are monogamous except the lion; and the reputation which some have for permanent mating is probably deserved only when an annual change of mate is impracticable because of scarcity or competition. They inhabit dens and lairs among rocks, in hollow trees, or dense thickets, without any special preparation, and the number of kittens does not usually exceed two in the large forms, but in the small species may be three, four, or five. These are usually born in the late spring of temperate latitudes or at the opening of the dry season in the tropics; and they remain under the guidance of the mother until nearly full-grown. Though many species are widely distributed, none are migratory, and few wander far, the tiger and leopard being the most inclined, perhaps, to wide ranging. The disposition of most cats is to remain near a settled lair—a disposition recognizable in the attachment to the house and to a favorite corner that distinguishes our house cats and makes them loath to change their location and customs. A certain inflexibility seems to characterize their minds, and the secrecy, noiseless stealth, patience, and ruthlessness which belong to their methods of life in the forest have affected their temperaments. The needful savagery of their nature is ingrained and as a rule unyielding to gentler influences in changed conditions. Hence they are, as a class, untamable, the very few exceptions having become the stock of the domesticated races. Most species can be made friendly to man only when kittens, asserting their feral natures and becoming untrustworthy as soon as growth brings sense of power and predacious instincts. Trainers have subjugated certain species, but they are kept in subjection by fear alone and make their performance unwillingly and without pride or joy in it. A few have been trained to hunt, but none to retrieve, and in general they approach sympathy with man and the attitude of companion and helper far less than dogs, which exceed them in certain directions of intelligence, as, for example, the understanding of mechanical appliances. A cat's expression of its emotions is mainly by "lashing" of the tail or a trembling of its tip, when excited; by spitting, yowls, and screams when very angry or sexually excited; by plaintive mewings when in trouble or desiring notice; and by a vibrating murmur deep in its throat (purring) when satisfied or contented. The position of the ears is very significant, as in most other animals; and the arching of the back, erection of the hair, and elevation of the tail, so familiar in our house cats, which thus try to make themselves look as large and terrible as possible in the presence of an enemy, are characteristic of all the smaller forms, though little indulged by the greater kinds. The relation of the cats to mankind generally is one of enmity—they are neighbors dangerous to him or his domestic animals which must be got rid of wherever civilization is to prevail. Hence they have mostly disappeared from thickly settled regions. The lion and tiger were inhabitants of Europe within historic times, but neither is now to be found near the Mediterranean on either side; and even the wild cat is rare in Europe,

except in wilder parts. The puma has been exterminated in the United States east of the plains, and lynxes are uncommon, while the jaguar has quite disappeared north of Central Mexico. In certain long-settled parts, however, jungles and mountain ranges furnish harbors for these beasts, which sally out to destroy human life, as in India and Africa, or to prey upon flocks and herds as in America.

Fossil Cats. The Felidæ seem to have been derived from somewhat primitive Miocene carnivores, the sabre-toothed tigers (q.v.) constituting the highly interesting family Nimravidae, which were themselves evolved from some earlier Eocene creodonts, perhaps *Palæonictis* and *Patriofelis* (q.v.).

The true felines appear first in the Lower Miocene of France, where they are represented by *Proailurus*, and in the Middle Miocene by *Pseudailurus*. The genus *Felis* appears first in the Middle and Upper Miocene of Europe and North America, and later in the Pliocene and Pleistocene of both these continents and also of Asia. As with several other races of animals, the Pliocene and Pleistocene members appear to have been of much larger size and to have inhabited more northerly countries than their modern descendants. The cave lion (*Felis spelæa*), whose remains are found in the cave deposits of Europe and England, was larger than the modern lion of Asia and Africa, of which species it seems to have been a variety. Equally large species are known from the American Pleistocene deposits. Fossil remains of many of the existing species of felines are found in the Pleistocene deposits of Europe and southern Asia.

Cats inhabit all parts of the world except Australia, New Zealand, southeast Malaysia, the Polynesian Islands, and Madagascar, the greater number being inhabitants of southern Asia. There are from 40 to 50 species (according to various views of specific rank in certain cases), divided by conservative zoölogists into only three genera—*Felis*, with 35 to 40 species; *Lynx*, the short-tailed cats, 6 species; and *Cynailurus*, 1 or perhaps 2 species. Most of these will be found described elsewhere under their names, as LEOPARD, LION, LYNX, OUNCE, TIGER, ETC., or under WILD CAT.

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The Domestic Cat. A cat, or cats, formed a part of the domestic circle in various parts of the world before the beginning of human record, and the question of the origin of the varied domestic races known within historic times may only be guessed at. Naturalists have attempted by a study of semifossil remains, mummies from ancient Egyptian tombs, a comparison of modern examples with wild forms of similar size, and a study of the reversionary tendencies exhibited by house cats that return to a feral life, to determine the origin of the race, but have learned nothing definite. The best opinion seems

to be that stated by J. E. Harting, F.L.S.: "Several wild species of Egyptian and Indian origin having been ages ago reclaimed, the interbreeding of their offspring and crossing with other wild species in the countries to which they have been at various times exported has resulted in the gradual production of the many varieties, so different in shape and color, with which we are now familiar."

Domesticated cats seem to have been common in Egypt before the time of the earliest records, for their mummies are coeval with the most ancient human remains and they are depicted on the oldest monuments. The same may, perhaps, be said of India, where they are mentioned in Sanskrit manuscripts at least 2000 years before Christ; and from India they were taken to China, where, however, they seem not to have been generally known until about 500 A.D. It was in Egypt, however, that the animal, which is considered to have been there, at least, the local gloved or Caffre cat (*Felis caffra*) domesticated, reached its highest importance, both as a mouser in that "granary of the world" and as an object of affection and veneration. It was naturally connected with the cat-headed moon goddess Pasht, both by its habits and by the fanciful resemblance of the gradual expansion of its pupil, as darkness came on, to the growth of the moon; was protected by priestly decrees and superstitions of great popular force, and was entombed in elaborate mummy cases. It is believed that the domestic cats of Europe, whence America received its stock, were derived from Egypt at a comparatively late day. It does not appear that they were known as domestic animals among the Assyrians or early Hebrews, and the mousers in the homes of the early classic Greeks were probably martens (*Martes foina*). Cats were possessed by the central Europeans of the Bronze age, and probably came to have more or less admixture with the European wild cats, but the basis of the stock from which our present varieties have descended is, no doubt, the Egyptian domesticated race. The Indian and Chinese may have originated quite separately from Asiatic species.

Domestic cats are now divided by the character and color of the coat, comparative length of tail, etc., into certain varieties recognized by fanciers, according to rules formulated by the societies which hold annual competitive exhibitions in New York, London, and other cities. The principal divisions are two—long-haired, or Asiatic, and short-haired, or European cats. The long-haired varieties are two, the Angora and Persian.

The Angora cat came originally from Angora and has a small head and rather large tufted ears; the long silky hair should hang in tufts and clusters, shortening towards the end of the tail. The colors are varied, but black and dark-slate colored ones with orange eyes, or blues and whites with light eyes, are most valued.

The Persian is also long-haired, but is larger in body and the fur is coarser, and increases towards the end of the long tail; the color may be almost any, but deep black with orange eyes is preferred; blue is the next best color.

The short-haired cats are mainly distinguished by their colors, as tortoise-shell, tabby, white, blue (or Maltese), etc. The hair may differ somewhat in length and texture, but in this respect the diversities are too slight and inconstant to count much. Tortoise-shell cats are rather small, long-bodied, and graceful; in color,

black, red, and yellow, rich and deep, and disposed in sharply defined patches upon short, close, silky hair. Eyes, bright amber to orange-yellow. The presence of white sets the animal aside into a variety known as *Tortoise-shell and White*, where the white should be in a distinct blaze on the face and on the breast and legs. All these cats are good mousers, but less affectionate than some others.

Tabby is the name given to banded or brindled cats, in allusion to the wavy pattern of their coats, like the old-fashioned "watered" fabrics from the East once known in commerce as "attali," and more lately as "taffety." Four varieties are recognized by fanciers—brown, spotted, blue (or silver), and red tabbies. Good examples of these types must conform to their standard; anything else is simply an unclassified "tabby cat." "The brown tabby," says Huidekoper, "has a ground color of a rich reddish dark brown, with no white, and even, regular bars and bands of solid shining black over every part of the body; these bands must be perfectly distinct, and there must be no spots." The *Spotted Tabby* may be of any base color, and is uniformly and equally spotted all over with black spots set in lines. The eyes of both these varieties should be orange. The *Blue or Silver Tabby* is a rather small, very slender, graceful, close-haired cat, bright blue or else silvery in color, setting off the jet-black narrow bands with great sharpness; cushion of the feet black; long tail, ringed; eyes orange for the blue, yellow for the silver race. The *Red Tabby* varies from reddish brown to red in base color, having well-defined bands of darker red and no white whatever; eyes, orange or yellow. This cat is an important factor in breeding tortoise-shells; in fact, 99 per cent of male tortoise-shell kittens are red tabbies, the females only, as a rule, being proper tortoise-shells. They are good-natured domestic cats, great mousers and hunters for birds; they are also expert fishers. *White* and short-haired cats form a special class, characterized by eyes of turquoise or clear sky-blue; or, if yellow, there must be no greenish tinge. These are quiet, affectionate cats, very often deaf. *Self-colored* cats include those which are of some one solid color, and their eyes should be orange yellow for the blue (or Maltese, as it is known in America), orange for the black, yellow for the gray, and gold for the red cat. The more uniform the color, the better. *Black* cats and *Black and White* cats are classed separately, and in the latter case the white should be only on the face, muzzle, breast, and paws; the eyes vary from orange yellow to sea green. The *Royal Cat of Siam* reverses this somewhat, being dun, or fawn color, with black face, ears, tail, and feet. The *Manx* cat differs from others not only in being tailless (as a rule), but also, like the Siamese variety, has the hind quarters decidedly elevated. A white Manx cat is almost unknown, and black ones are exceedingly rare.

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CAT (in old ships the catfall led through the cathead, a projecting beam on the bow frequently ornamented with a cat's head). In nautical parlance, the *cat* or *cat purchase* is a device used in getting the anchor up in the securing position after it has been hoisted by the capstan as far as the hawse pipe. See **ANCHOR**.

CAT. In military engineering, a heavy beam with a sharp iron point, used during the Middle Ages in besieging castles or towns. It was provided with a movable cover of timber, for the protection of those who worked it, by swinging it back and forth. It was called a *cat* because it clawed into a wall. It was also known as a mouse or fox because it gnawed a round hole, and as a hog or sow, from the round back of its cover, or because it worked with its tusks, like a boar. The name "cat" was also used for a hurdle protection under which men could work at undermining walls.

CAT, THE. The instrument employed for the flogging of persons sentenced to that punishment. It consists of a whip with nine tails, and the punishment, as usually prescribed, is inflicted on the back of the offender. It was formerly employed in the British army in case of certain breaches of discipline by soldiers, but its use was abolished in 1881 by the Army Act (44 and 45 Vict., c. 58, § 44). It is still employed in the British navy. The punishment may in certain cases be imposed by the courts of England on offenders over 16 years of age, especially by a recent Act of Parliament (1912) on "white slavers," and it is still commonly employed in that country as a means of administering discipline in prisons. It has been generally done away with in the United States except in Delaware, where it is employed as a punishment for wife beating and some other offenses, and in a few States as a means of enforcing discipline in prisons. See **WHIPPING**.

CATABANGAN, kät-a-bäng'an, or **CAT-BAGANES**. See **KATABAGANES**.

CAT'ABAPTISTS (Gk. καταβαπτιστής, *katabaptistēs*, from *κατά*, *kata*, down + *βαπτίζω*, *baptizein*, to baptize). A general name applied by Zwingli and others, instead of the more common term "Anabaptists," to those who baptized only believers and denied the validity of infant baptism. The term was defined by Zwingli as equivalent to "pseudo-baptist," but the fact that etymologically it means a *drowner* was not lost sight of.

CAT'ACAUSTIC CURVE. See **CAUSTIC**.

CAT'ACHRE/SIS. See **RHETORIC, FIGURES OF**.

CAT'ACLYSM (Fr. *cataclysmes*, Lat. *cataclysmos*, Gk. κατακλυσμός, *kataclysmos*, from *κατά*, *kata*, down + *κλύειν*, *klyzein*, to dash, or waves). A term used by some of the earlier geologists to denote sudden changes, such as those which might be produced by deluges, as

the Noachian Flood, or by sudden upheavals. They considered that deposits such as the drift were formed in this manner. The word has been dropped from geological terminology. See CATASTROPHISM.

CATACOMBS, kăt'ă-kômz. A subterranean vault or excavation used for the burial of the dead. The term is of uncertain derivation and is used to designate a network of subterranean chambers and galleries excavated in the soft rock, and especially those used primarily for burial purposes by the early Christians, and, in times of persecution, for refuge and for religious services. They were called by contemporaries *cæmeteria*, 'cemeteries' (sleeping chambers), or *crypta*, 'hidden places'; the term "catacomb" (*catacumba*) is of mediæval origin. The lower classes of Romans were usually cremated, and their ashes put into urns in sepulchral chambers called *columbaria* (q.v.); but Christian usage forbade incineration, so separate burial was resorted to in property belonging to wealthy converts or purchased by association. Burial in cemeteries above ground was used generally, but where the subsoil consisted of some kind of easily worked, rocklike tufa, the burial was made in underground galleries, which we now call catacombs. Such catacombs exist in various parts of the early Christian world—the Crimea, Asia Minor, Syria, Egypt (Alexandria), Cyrenaica, Tunis (Sousse), Malta, Sicily (Syracuse), Italy (Rome, Naples, Chiusi).

By far the most important group is in Rome, and it is by the study of these Roman catacombs that we know anything of the Christian arts of the first four centuries and can better understand the life and feelings, manners and customs of the early Christians. About 60 of these are known. They are all outside the city walls, within a radius of 3 miles, excavated in the tufa wherever it was of the right kind, i.e., granular. The larger ones consist of a confusing maze of galleries, but this was by no means their original condition; rather, the result of gradual evolution. During the first and second centuries a Christian landowner would establish a small catacomb for the burial of his family, freedmen, and slaves, and would set aside for the purpose a small rectangular patch of ground, or *area*, measuring, say, 100 by 200 feet, which was registered as a family burying ground and became inviolable under common Roman law. A single gallery ran within the outer edge of this rectangle, about 8 feet high by 3 feet wide, in whose sides were cut *loculi*, one above another, to receive the bodies. The *loculus* was low, as long as the body, and its depth varied to contain from one to three or four members of the same family. Persons of distinction were buried in chambers, or *cubicula*, which opened out of these galleries, and for these burials carved sarcophagi were often used, placed in arched niches, or *arcosolia*. Usually some martyr was buried in such chambers, and his tomb served as an altar at which services were celebrated. As Christianity progressed and burials multiplied, the plot of ground was honeycombed with galleries, parallel and at right angles; and when one story of them was no longer sufficient, staircases were made and a second line of galleries excavated beneath. This was followed, if necessary, by a third, fourth, or even fifth story of galleries. Sometimes the extra room was gained by increasing the height of the galleries through

lowering the floor level. As persecutions increased in virulence, the catacombs became places of refuge and worship, where Christians could avoid arrest, as burial places had right of asylum by law, and when churches above ground were confiscated and destroyed by Imperial orders and religious meetings interdicted, it was always possible to use the catacomb chapels for services. Such importance did the catacombs, therefore, assume that in the third century their administration was no longer left in the hands of private persons, but was assumed by the Church. The city was divided into parishes—25 or more—and to each one was assigned a catacomb outside the walls for the burial of its church members. Above its entrance was a chapel for religious services. The head deacon of the church was their administrator, and under him were the body of *fossores*, or excavators, the artisans who executed the marble slabs with their inscriptions and symbols, the lamps and the symbolic wall paintings. The chief cemetery then became that of Calixtus, and here the bishops of the third century were buried in a special crypt. Passages were cut to connect the neighboring catacombs, but without allowing the burials to extend beyond the appointed legal limits. A new period began, however, in the middle of the third century, when the violence of popular hatred refused any longer to recognize the inviolability of the Christian places of burial, and persecuting mobs and officials invaded them. Christians then destroyed the entrances, with their oratories, feasting halls, and open staircases, filled up the front galleries, and made other and secret entrances, usually from neighboring sand pits (*arenariæ*). There was no longer any need to restrict the catacomb limits, as there was no longer any legal protection, so all the spaces between the various small catacombs were honeycombed with passages, and one immense catacomb was made out of many. Thus all regularity of arrangement was lost, and the present intricate type created. All the catacombs in a single high ridge, up to the low parts where excavation had to be stopped for fear of flooding, were thus joined, and a few large groups created around the city. The bloody persecution of Diocletian multiplied burials of martyrs and made wholesale enlargement necessary. Then came, with Constantine, the end of persecution. Soon Bishop Damasus voiced the universal reverence by his monumental restorations, clearing passages, identifying tombs of martyrs, and placing commemorating inscriptions in verse, building or decorating underground chapels and basilicas at the entrances. During the whole of the fourth century, and until about 410 A.D., burials continued to be numerous in the catacombs, through the desire of the faithful to rest near the martyrs; and then, finally, all burials were transferred to the surface cemeteries connected with churches. The catacombs, however, provided with small basilicas and chapels at their new entrances, remained objects of sacred pilgrimages and anniversary services, not only for Romans, but for pilgrims from the whole Christian world, and several literary records of such pilgrimages remain, from the poems of Prudentius to the *Itinerary of Einsiedeln*. Then came the disastrous invasions of the Goths, Vandals, Lombards, and Saracens, which involved the destruction, first or last, of all suburban buildings, the transporting to the city of the relics of

the most noted martyrs from the catacombs, the closing of their entrances, and the filling up of their galleries with earth to prevent desecration—especially at the time of the Saracen invasion in the ninth century. From that time until the sixteenth century the catacombs were entirely lost sight of. After that they were gradually reopened, and explored by such men as Bosio (1593–1629), Boldetti, Marchi, and especially by De Rossi; but their riches have by no means yet been exhausted.

The following is a list of the principal catacombs around Rome, arranged according to the Roman roads along which they are placed: *Via Appia*, Catacomb of Calixtus, Catacomb of Prætextatus, Catacomb at Catacumbas; *Via Ardeatina*, Catacomb of Domitilla; *Via Portuensis*, Catacomb of Pontianus; *Via Salaria Vetus*, Catacomb of Basilla, or St. Hermes; *Via Salaria Nova*, Catacomb of Maximus, or St. Felicitas, Catacomb of Thraso, Catacomb of Priscilla; *Via Nomentana*, Ostrian Catacomb, Catacomb of St. Agnes; *Via Tiburtina*, Catacomb of Hippolytus, Catacomb of St. Laurentius (also called Cyriaca); *Via Labicana*, Catacomb of St. Peter and Marcellinus. Of all these, that of Calixtus is by far the most important and has been the most fully illustrated. It contains the famous papal crypt, where the popes of the third century were buried, and an analysis of its component parts best illustrates the growth of a large catacomb from the union of many units—in this case some 12 in number. Its earliest nucleus was the crypt of Lucina, the private burying lot of that matron. Not only this and other parts of the catacomb date from the first century or early second century, but the same is true of parts of the catacombs of Domitilla and Priscilla, which almost rival that of Calixtus.

The historic interest of the Roman catacombs is incalculable. All the churches belonging to the pre-Constantinian period seem to have disappeared without leaving a trace behind; consequently, the chapels of the catacombs are alone in showing how the early liturgical prescriptions—e.g., those of the *Apostolic Constitutions*—were conformed to. The old theory that the catacombs had been really excavated as sand pits and for the extraction of tufa by the pagan Romans, and had been simply appropriated by the Christians, was first attacked by Marchi and totally disproved by De Rossi; they are entirely the work of the Christians themselves and were sometimes connected with the sand pits only as a matter of convenience in the third century, as already explained. Using ancient literature as a guide, De Rossi undertook a series of excavations by which he laid bare a large part of ancient subterranean Rome, at the expense of the papal government, aided by private subscriptions.

After the Italian government had occupied the Papal States, in 1870, Parliament decreed that not only should the Vatican, with St. Peter's, St. John Lateran, the summer residence of Castel Gandolfo, etc., remain under the jurisdiction of the Pope, but also the catacombs, which the government authorities cannot, therefore, excavate. It is partly from lack of funds, partly from the opposition of private landowners, that excavations are so slow and spasmodic. About 15,000 inscriptions have come to light, but this is only a fraction of what remains underground. De Rossi believes they once

numbered over 100,000. After the catacombs were rediscovered, in 1578, they were recklessly despoiled, especially of inscribed stones, which were collected as curiosities or used by hundreds as building material. In this way a large part of their epigraphic riches was dispersed and destroyed, and no systematic collection of early Christian epigraphy was ever made, such as was the case with classical inscriptions. Whatever could be done at so late a date was done by the late De Rossi, who grouped the available materials in one of the galleries of the Vatican, arranged according to their themes. In the Vatican Museum, also, are many of the small objects rescued from the catacombs (*Museo Cristiano*, etc.); others are in the Kircherian Museum over the Biblioteca Nazionale. The Lateran Museum has the greatest collection of sarcophagi, as well as some facsimiles of frescoes and many inscriptions—a collection made under Marchi and De Rossi. The catacombs themselves can be visited with ease in all important parts, and though most of the inscriptions, *tituli*, and small objects have been removed, enough remain in situ to show what the original condition must have been.

It was natural that the data furnished by the catacombs for the earliest Christian history should give food for heated partisan controversies between Roman Catholic and Protestant archaeologists, the latter denying the postapostolic age claimed by De Rossi for the earliest monuments, and disputing many interpretations of catacomb frescoes that seemed to support Catholic dogmas. Schultze has been the most vigorous of the Protestant archaeologists. However, the general unprejudiced consensus of opinion is in favor of De Rossi's views. The investigations of De Rossi have been continued under exceptionally favorable conditions by Joseph Wilpert, whose recent works, containing a careful discussion of all historical, artistic, and technical considerations with photographic illustrations, many of them reproducing actual color, is the final word upon this subject. It is a thorough revision of De Rossi's earlier work.

The decorative art of the catacombs is confined to the chambers where the most distinguished persons received burial; the long galleries, or *ambuloira*, where the masses were buried, remained perfectly plain, with straight sides and arched or pointed roof, roughly hewn. The burial cavity, the *locus* or *loculus*, was closed with a *tabella*, or slab, on which was cut the *titulus*, or funerary inscription, usually accompanied by one or more emblems, or even figures. To it were also attached a variety of objects in the shape of offerings, such as terra-cotta lamps, that were kept burning on anniversaries, as well as glass vases or bottles, medals, coins, etc. At intervals a shaft was cut connecting the gallery with the surface and letting in light and air. They were called *luminaria* and were funnel-shaped. They were also used for extracting the material excavated from a gallery and for letting down sarcophagi. The chambers opening at intervals from the galleries were either the smaller *cubicula*, which were private burial rooms for families or associations, or the larger *cryptæ*, used for religious services and for the burial of great personages and martyrs. These crypts were provided with altars and seats, and were often double, so as to provide for the separation of the sexes. Here are to be found the majority of the *graffiti*, scratched by

pious pilgrims; here are the monumental inscriptions and the pious desecration of earlier tombs to bury others near the martyr.

The small catacombs in their primitive arrangements can be studied in those of Domitilla (near the entrance), of Priscilla, the Ostrian, and that of Lucina, in the Calixtus group; to these must be compared the two superb halls of the catacombs of St. Januarius at Naples. They date almost certainly from the close of the first century, from the generation after the Apostles, and here some of the earliest converts were buried. In the second century comes the rich Catacomb of Prætextatus, with its superb ambulatory, and three others that are not yet explored. This is, from the purely artistic point of view, the Golden age. The frescoes in the Catacomb of Domitilla are the most artistic yet found; the motif of the vine with cupids gathering the vintage, which afterward becomes stiff and geometric in its composition, is here free and gracefully naturalistic. The same decorative feeling is shown in some landscapes in the same chambers. There is a flavor of the Augustan age. The paintings that have a more definite religious character are also treated with naturalism—pastoral scenes of fishing and shepherding, symbolic of baptism and redemption; Noah and Daniel, both types of saved souls; two figures at a banquet of loaves and fishes, either of eucharistic significance or representing the joys of paradise. The crypt of Lucina has the most beautiful and well-preserved of painted crypt ceilings, which reminds one of such pagan ceilings as those of the baths of Titus. It has a graceful, symmetrical arrangement of compartments with single figures. Were it not for well-poised figures of the Good Shepherd and the *Orans* in the spandrels, and of Daniel in the centre, the rest of the decoration, with its flying genii, heads of the Seasons, doves, vases, fruits, and flowers, might very well belong to some pagan tomb of the Via Latina. Almost as charming is another ceiling of the same character in the Catacomb of Calixtus, with a decorative frame of concentric circles and spandrel ornaments, within which are peacocks, doves, winged genii, shells, and vases, and with nothing but the Good Shepherd in the centre as a proof of Christianity.

To understand the reason for the selection of certain themes for the frescoes, it must be remembered that their object was to commemorate the departed. The key is given in the prayer for the dying of an early liturgy: "Deliver, O Lord, the soul of thy servant, as Thou deliveredst Enoch and Elijah from the common death, . . . Noah from the deluge, . . . Job from his torments, . . . Isaac from the sacrifice, . . . Moses from the hand of Pharaoh, . . . Daniel from the den of lions, . . . the three youths from the fiery furnace," etc., to which other prayers add the examples of Tobit and Jonah. These are precisely the themes from the Old Testament most commonly depicted in the frescoes, always with this symbolic meaning.

The portrait of the deceased is very seldom given, either in painting or in outline on the slab, because it did not harmonize with the stress laid by Christian sentiment upon the future life. It was the soul, not the body, of the defunct that was, therefore, typified in different forms. The female figure, with both hands raised in prayer, is the main symbol both of the individual soul and of the whole body of be-

lievers—the Church. She is called the *Orans* (*orare*, to pray). The companion figure to the *Orans* is Christ as the Good Shepherd. These two—the Saviour and the saved, the Shepherd and the sheep—are substantially the whole of the significant part of earliest Christian imagery, as we see it on the ceiling of the crypt of Lucina. But the soul was also represented in other obvious ways—as a *lamb*, mainly emblematic of the elect on earth, not in heaven; as a *dove*, the soul in heaven; as a *fish*, in the image of Christ, the divine fish, who is called the *Fish of the Living*. In almost every such symbol the meaning is complex, and with subtle but simple transitions. Thus, the dove is: (1) the emblem of the Holy Ghost, and as such descends on Christ at baptism and on the Apostles at Pentecost; (2) the Divine Messenger, like the dove of the ark, and as such brings assurances of peace and salvation to the soul, as in the epitaph of Irene at St. Calixtus, where the soul, as an *Orans*, is receiving an olive branch from a dove; (3) as the transfigured soul after death, *palumbus sine felle*, in which sense the Twelve Apostles are represented as doves. Of all these facts the central idea is that the dove is the vehicle of the spirit, whether sent from God or returning to God. Two of these separate meanings are combined in some compositions, where in Noah's ark, representing the Church, stands, not Noah, but the soul of the deceased, towards which the dove is flying with the olive branch. Another series of symbols is that embodying the cardinal Christian beliefs—the anchor is hope and the cross; the fish is the divine food and Christ, as well as the believer; the peacocks are immortality; the phoenix is resurrection; flowers are paradise. The regeneration by baptism and by partaking of the Eucharist are also themes represented from first to last, beginning in the sacramental chamber of the Catacomb of Domitilla.

The sepulchral inscriptions or epitaphs discovered in the catacombs belong to every stage of their history and to every variety of technique. Some are beautifully engraved, others irregularly; some are scratched rather than cut on the marble slab; some of the earliest are not cut, but painted in red or black; while others are traced on the fresh mortar. At times the front of the *locus* is closed by a single inscribed slab, and the lettering is inclosed in a frame; at times the *tabella* is made up of two or three pieces, or is even of terra cotta. It is extremely interesting to note that the majority of the earliest inscriptions, before the middle of the third century, are not in Latin, but in Greek—a sign of the preponderance of Greeks among the early converts, and of Greek as the sacred tongue. The earliest are the simplest; they also are least often dated. Often the bare names of the deceased are given, without mention of age, day of death, or the relative who set up the memorial—facts that are very common in the third and fourth centuries. Very usual, in these earliest cases, are the exclamations of simple faith and prayer, which later go out of fashion. One feels that the early formulas were more personal; the later, in accordance with an official rubric. In Northcote's selected specimens (page 33) are examples where the one name stands alone as the whole inscription, "Honorata"; or the usual triple name, "C. Munatius Octavianus"; a simple acclamation, "O Eusebius, mayest thou live." Other acclama-

tions added to the name are: "May God refresh thy spirit"; or "Pray for thy husband"; "Sweet soul, mayest thou live"; "Live in Christ and pray for us." We obtain from these inscriptions the clearest conception of simple Christian faith and constancy. The early liturgies, when they say, "Gather them, Lord, in a green pasture, by waters of rest, in a paradise of joy, whence all trouble, all sadness, and sighs are banished," and the like, give a picture of which these inscriptions are the counterpart, and which find a naïf illustration in some catacomb frescoes which depict the elect in paradise. Such is a fresco in the catacombs of St. Soter.

The ancient authorities that help in identifying the catacombs, in tracing their historic stages and connecting them with different martyrs are: the *Acta Martyrum*, or reports on martyrdoms, more or less contemporary, which often relate where the bodies were placed; the *Liber Pontificalis*, early lives of the popes, which mention transformations and papal burials in the crypts; the inscriptions of the catacombs themselves; the early literature, such as the poems of Prudentius, the poetic inscriptions of Pope Damasus; the descriptions of pilgrims, such as the *itineraries* of the seventh and eighth centuries; the topographical monographs on Rome of the later Middle Ages, such as the *Mirabilia Urbis Romæ*.

Bibliography. The earliest important work on the subject, Bosio, *Roma sotterranea* (Rome, 1650), was a most reliable contribution. It was even used in the fundamental modern books on the subject, as those of Giovanni Battista de Rossi, who not only published descriptions of the most important catacombs and their contents, but established the correct method for studying and identifying them, determining their dates and history. He founded the science of early Christian archaeology by his *Roma sotterranea cristiana* (3 vols., Rome, 1864-77); his *Inscriptiones Christianæ Urbis Romæ* (2 vols., Rome, 1857-88); his *Bullettini di archeologia cristiana*, published quarterly since 1863, and his part of the *Corpus Inscriptionum Latinarum* that refers to Christian inscriptions. His work has been ably continued by Mgr. Wilpert, whose *Le pitture delle catacombe romane* (Rome, 1903), published also in German (Freiburg, 1903), reproduces all the important frescoes in color. The English manual of Northcote and Brownlow, *Roma sotterranea* (2 vols., London, 1879), the French of Allard, *Les catacombes de Rome* (Paris, 1896), and De Richemont, *Nouvelles études sur les catacombes romaines* (Paris, 1870), the German of Kraus, *Roma sotterranea* (Freiburg, 1879), are all of them summaries of De Rossi's results. Each language has also had a Dictionary of Christian Antiquities which embodies the same materials, though it also treats of the later period: Martigny, *Dictionnaire des antiquités chrétiennes* (Paris, 1877); Smith and Cheetham, *Dictionary of Christian Antiquities* (London, 1875-80); Kraus, *Real-Encyclopädie der christlichen Alterthümer* (Freiburg, 1880-86). Still later handbooks have been issued—some more systematic, others more detailed, and usually showing some independence of judgment. Such are: Pératé, "L'Archéologie chrétienne" (Paris, 1892), in the *Quantin Series*; Schultze, *Die Katakomben* (Leipzig, 1882); Wilpert, *Prinzipienfragen der christlichen Archäologie* (Freiburg, 1892); and lastly Marucchi's two small volumes, which give the fullest and ablest

modern statement: Marucchi, *Le catacombe romane* (Rome, 1903), *Manuale di epigrafia cristiana* (Milan, 1904). See also Desnier, *Les catacombes de Rome* (Paris, 1909).

CATACOMBS OF PARIS. Vast excavations extending under the city of Paris, formerly subterranean quarries which furnished the building material for the city. In the latter part of the eighteenth century some portions of the city began to sink, and it was necessary to strengthen the roof of the quarries with masonry. In 1787 the catacombs were arranged to contain the bodies removed from other burying grounds, and it is estimated that upward of 6,000,000 bodies are now preserved in them. The bones are arranged in varied designs along the sides of the galleries.

CAT'AFALQUE (Fr., OF. *cadefant*), or **CATAFALCO**, *kä'tä-fäl'kô* (It., from It. dial. *catar*, to find, OSP. *catar*, to see, Lat. *capture*, to try, to seize, to watch, from *capere*, to hold + **falco* for *balco*, stage, Ger. *Balke*, AS. *balca*, beam). A temporary structure of carpentry, decorated with hangings, sculptures, and paintings, intended to represent a tomb or cenotaph. It was used for the lying in state of notable deceased persons and at commemorative services. (See CENOTAPH.) The catafalque was sometimes so extensive a structure as to become a mortuary chapel (*chapelle ardente*); it was usually erected inside a church. Movable catafalques are employed in funeral processions. A magnificent catafalque was used at the burial of Michelangelo in Florence. It was executed by the principal Florentine artists of the time.

CAT'ALAN. See CATALONIA.

CATALAN GRAND COMPANY, THE. A powerful band of mercenaries noted for the part it played in the wars of the Byzantine Empire during the first half of the fourteenth century. It originally consisted of natives of Aragon and Catalonia, partly Christian and partly Moslem, who fought in Sicily during the wars that followed the famous Sicilian Vespers, in 1282. With the conclusion of peace in 1302, the Catalans, numbering some 6000 men, under the leadership of Roger de Flor, entered the service of Andronicus II, Emperor of Constantinople, and were sent against the Turkish armies which were then ravaging the Asiatic provinces of the Empire. The Catalans defeated them decisively and then entered upon a course of pillage and rapine, unchecked by the remonstrances of the Emperor, who was too weak to enforce obedience to his orders. In 1306 Andronicus caused Roger to be assassinated at Adrianople, and a great number of the Catalans fled. A band of 1500, however, consisting mostly of Frenchmen, after defeating an army of 43,000 men, seized the fortress of Gallipoli, on the Hellespont, and held it for four years against the Emperor, ravaging Thrace and levying tribute on trade. In 1310 they abandoned Gallipoli and, marching into Greece, entered the service of Gualtier de Brienne, Duke of Athens, whom, in the following year, they overthrew in a battle on the Cephissus, making themselves masters of Beotia and Attica. The widows and daughters of the fallen Latin nobles became the wives of the Catalan officers. Subsequently the Duchy of Athens was made an appanage of Aragon. The power of the Catalans rapidly declined, and disappeared before the end of the fourteenth century. Consult Gibbon, *Decline and Fall*, chap. lxi.

CATALANI, ká'tá-lá'né, ANGELICA (1780-1849). A celebrated Italian soprano, born at Sinigaglia. She was educated in the convent of Santa Lucia, Gubbio, where in her seventh year she displayed such wonderful vocal powers that strangers flocked from all quarters to hear her. After two years of study with Boselli she made her first appearance in Venice in her sixteenth year, and the furor she created was extraordinary even for Italy. She swept through the chief cities of Italy like a meteor, arousing enthusiasm everywhere. She sang in Lisbon from 1801 to 1806; married Captain Vallabregue, then attaché in the French Embassy, and reaped a golden harvest in Madrid and Paris. Her success in London (1806) eclipsed all her previous efforts, and she stayed there from 1807 to 1814, worshiped by her audiences. She was then in the zenith of her vocal powers and fame. Napoleon's exile permitted her to go to Paris, where she was made directress of the Italian opera. Her husband was an incapable business man, and the venture absorbed the sums of money she had made. In 1817 the lease and subvention were withdrawn and Catalani found herself compelled again to turn to the operatic stage for a living. For 10 years she traveled all over Europe, her performances evoking ever-increasing enthusiasm. In 1828 she retired from the stage, lived for some time in Paris, and then (1830) settled at her villa near Florence, where she established a free singing school for talented girls. She died of cholera in Paris. Catalani was a woman of exceptional beauty, and, though large of frame, of infinite grace and majestic appearance. But her greatest gift was her voice, a soprano of nearly three octaves in range. Its unsurpassed power and flexibility made her one of the greatest bravura singers of all times. Consult: Edwards, *The Prima Donna*, vol. i (London, 1888); Ferris, *Great Singers* (New York, 1893); Needham, *Queens of Song* (London, 1863); H. C. Lahee, *Famous Singers of To-Day and Yesterday* (Boston, 1900).

CATALAN LANGUAGE AND LITERATURE. This language is an important member of the group of Romance languages (q.v.). It is spoken to-day by more than 3,500,000 people living (1) in France, in a territory embracing the former countships of Roussillon, Vallespir, Conflent, Cerdagne, and Capcir, or nearly the whole of the present Department of the Pyrénées Orientales, with about 200,000 inhabitants; (2) in the eastern portion of the Pyrenees and along the coast of the Iberian Peninsula, including the seven Spanish provinces of Gerona, Barcelona, Lérida, and Tarragona (comprising the former Principality of Catalonia), and Castellón de la Plana, Valencia, and Alicante (which formed the ancient Kingdom of Valencia); (3) in the Balearic and Pityusen islands (which constituted the former Kingdom of Majorca); (4) in the District of Alghero in Sardinia; and (5) in some parts of Cuba and the Republic of Argentina. For some years past it has been popular among philologists of a certain school to deny to Catalan an independent individuality, and to claim that instead of being independent of Provençal, it was merely a dialectal offshoot, which during the Middle Ages raised itself for a time to the dignity of a literary language. Diez and Milá y Fontanals saw more deeply beneath the surface than have some of their successors, and claimed for Catalan entire independence as a language. To-day the

latest school of philologists has found additional proof in support of that view. It must not be forgotten that whereas to this day Provençal is not spoken south of the Pyrenees (as has already been said), Catalan is spoken north of the Pyrenees in nearly the whole of the Department of the Pyrénées Orientales and that the line of demarcation is very clear. French phoneticians admit that one does not pass gradually from Provençal to Catalan; and Alart as long ago as 1877 (*Revue des langues romanes*) made the following remarkable statement: "The separation is especially marked between the cities of Estagell and La Tour de France, which are situated at the two extremities of a plain, at a distance of about three quarters of an hour one from the other; Catalan is spoken in the former, which has always belonged to Roussillon, and Provençal in the second." On the other hand, the boundary to the west of Catalan shows the twilight zone that is usual between two kindred speeches developing freely on neighboring soil; and we must definitely range Catalan in the group of the Hispanic languages, with a physiognomy as clearly outlined as is that of her sisters Castilian, Portuguese, and Gallegan. The chief peculiarities of Catalan are: (1) the prevailing use, in the conjugation in *-ir*, of the so-called inchoative form, a form known to some extent to all the Romance languages, excepting the rest of the Hispanic group (it should be noted in passing, however, that both Spanish and Portuguese make extensive use of inchoative forms, but that, instead of limiting them to certain parts of the conjugation, they have extended them throughout the entire paradigm); (2) the formation of a number of perfect participles from the perfect stem, instead of the infinitive stem; (3) the failure to merge into one the pronunciation of *b* and *v*, and the persistence of the voiced sound of intervocalic *s*; (4) the treatment of unaccented final vowels, *a* being retained and the other vowels dropped under the same circumstances as in French, Provençal, and Aragonese (which is a variation of Castilian); (5) Latin *au* becoming *o* as in Castilian, whereas Provençal retains *au*; (6) Latin initial *l* becoming mouillé, a change unknown to Provençal or Castilian; (7) occlusive consonants before *r* (e.g., *dr*) being treated as though intervocalic; and intervocalic *z* becoming, as early as the thirteenth century, a mere aspiration; (8) the vocalization of final dentals which, according to E. Bourciez (*Éléments de linguistique romane*, p. 337), is the essential characteristic of Classic Catalan, and assures to it its place apart; (9) the total absence of noun declensions, which sharply differentiates Catalan from the whole of the Gallic group and has seldom been accorded its due weight in considering the affiliation of Catalan with the neighboring languages (a few sporadic cases of Nominative and Accusative forms, nearly all of them direct borrowings from Provençal, were always treated, as were similar manifestations in Castilian, as convenient double forms to be used interchangeably, and they never had any morphological or syntactical significance); (10) the retention of the original pronunciation of the Latin *u* where the French and Provençal have *ü*. This latter is an exceedingly important difference between Catalan and the Gallic group, and has not yet been satisfactorily explained.

In Catalan literature, more than in any other of the Romanic group, are prose and verse

sharply differentiated. Under the influence of the splendor to be found in the literary courts of the independent Provençal potentates, Catalan poets adopted the verse forms (and to a large extent also the artificial language suited thereto) of the Provençal troubadours and the Toulouse Academy. We must bear in mind, however, that at the time when this was done, and for several centuries thereafter, Catalonia and the Catalans owned and ruled an important bit of territory now in Provence's power. That this poetic imitation was not due entirely, nor even in large part, to heaviness or inflexibility of the Catalan language, is shown by two facts: first, that the prose of the period, while written almost exclusively in the vernacular, was effective; and second, that in later periods, when the language had become even more polished and flexible, the poets still continued to use the traditional forms. This state of affairs is all the more evident when we consider the works of later authors who were both poets and prose writers, e.g., Lull, whose poems show Provençalized Catalan, as against his prose works, which are more markedly native Catalan. Among other important names for this later period mention should be made of Muntaner, Pere March, and Bernat Metge; and there are a few important anonymous works, e.g., the *Sete Savis* and the *Facet* (a translation of a book on good breeding).

This state of things continued until the fifteenth century, which is the Golden age of Catalan poetry. Under encouragement from three successive rulers (John I, 1387-95; Martin I, 1395-1410; Ferdinand I, 1410-16) there was established at Barcelona a consistory of the "Gay Saber" or "Gaya Ciència," copied from that of Toulouse. But the very existence of this new consistory on Catalan soil soon eliminated from Catalan poetry the worst of its servile imitation or adaptation of Provençal poetic customs. True, the new academy accepted the rules of versification set up by the older academy in the *Ley's d'amors* of Guillaume Molinier, along with the names for the various types of stanza; but the language used in poetry shows a constantly increasing devotion to purely Catalan forms, until it becomes like that of the prose: an entirely native product. A few (there are about 100 poets represented in the various cancioneros that have come down to us) of the brilliant names of this period are: Pau de Bellviure, Jordi de Sant Jordi, Jaume March, Pere March, and Antoni Vallmanya. The one great light that outshone all the others, however, was Ausias March, the Valencian (died 1458), whose works first appeared in a Castilian translation in 1539 (by Baltasar de Romani and Jorge de Montemayor), and in their original Catalan form in 1543. Despite his deliberate obscurity, his work contains many poems of real beauty. In his *Cants d'amor* he is a frank follower of Petrarch, but in his *Cants de mort* there is a note that is peculiarly his own. Of a wholly different nature is Jaume Roig (died 1478), another Valencian, whose *Llibre de les dones*, a bitter and caustic satire on women (purporting to be his own experiences in three different marriages), is exceedingly interesting as a brilliant and trustworthy picture of Valencian life and habits in the fifteenth century. The decline of Catalan poetry was due not to a cessation of genius on the part of Catalan poets, but to the loss of independence of Aragon and the triumphant rise and spread of Castilian.

One should not forget that it was a Catalan, Juan Boscán, who inaugurated and established in Castilian a new kind of poetry. One can but conjecture what would have been the effect on Catalan poetry if Boscán had consented to use his own native language; but it may safely be asserted that his defection marks the end of the Golden age of Catalan poetry.

Catalan prose works of note are not so ancient as the poetry, there being nothing of great importance earlier than the end of the thirteenth century, but they gain by being purely Catalan in language. Chronicles earn a high place in this literature, and there are at least four that can stand comparison with the four great French chronicles, viz., that of James I (died 1276); that of Bernat Desclot, which treats the reigns of James I and Pedro III (1276-86), the latter alone being a first-hand treatment; that of Ramon Muntaner, for the Catalan expedition to the Morea and the conquest of Sardinia by James II; and that of Pedro IV (1335-87). In the fourteenth century we have also the varied works of the Doctor Illuminatus, Ramon Lull (died 1315), who always wrote in Catalan (the Latin versions of his works being made by his disciples). His most important prose works, from a literary point of view, are the *Llibre de les maravelles*, the *Llibre del orde de cavalleria*, and the Utopian novel *Blanquerna*. Another important writer of religious, moral, and political works was Francesch Eximeniz (born about the middle of the fourteenth century), whose principal work was a large Christian encyclopædia, called *Lo llibre appellat Orestia*, which he probably never completed, and of which we have only a few entire parts or books (1, 3, 12, and possibly 2, of the 13 that were planned). Among his other works, his principal titles to fame are: *Vida de Jesucrist*, *Llibre dels angels*, and *Llibre de les dones*. This last-named work is from a literary as well as from a cultural and historical point of view the most interesting of all his works and is filled with details concerning the private life of the average Catalan woman, and gives us some idea of the luxury of the times. Lull and Eximeniz exercised influence beyond the borders of their own land, and their works were translated into French shortly after their appearance. In the fifteenth century we find translators and historians of worth. The spirit of research and control of material that permeate the *Llibre dels feyts d'armes de Cathalunya* of Bernat Boades (died 1444) would make it remarkable even to-day, and in addition thereto it has style. As early as the fifteenth century there were also important romances of chivalry and romances of adventure, among which may be mentioned the *Tirant lo Blanch* (highly praised by Cervantes in *Don Quijote*) and the *Curial y Guelfa*. A facsimile reproduction of the Sapienza copy (now in the Hispanic Society) of the 1490 edition of the *Tirant lo Blanch* was published by A. M. Huntington in 1907. Consult also the *Discursos leídos en la Real Academia de Buenas Letras en Barcelona, en la Recepción Pública de D. Isidoro Bonsoms* (Barcelona, 1907). It is a very important treatment of the entire question of *Tirant lo Blanch*. *Curial y Guelfa* was made accessible in a good edition published in Barcelona (1901), by Antonio Rubió y Lluch for the aforementioned Barcelonense Academy of Letters. In the sixteenth century there are only

two poets whose works have lived: Joan Pujol (who must be considered one of the last of the real Catalan troubadours) and Pere Seraffi (whose works are imitations of the style of Ausias March, without his obscurity, but written under the rising influence of Castilian). The prose of this period shows no great creative genius, and such good prose as we have is the work of scholars, antiquarians, and historians. The seventeenth and eighteenth centuries are a desert waste.

The nineteenth-century renaissance began with Carlos Buenaventura Aribau (whose *Oda à la patria*, written in 1833, is one of the best poems in Modern Catalan). Then came Joaquin Rubió y Ors, whose pen name was Lo Gayter del Llobregat, Antonio de Bofarull, who made celebrated the name of Lo Coblejador de Moncada, and Victor Balaguer (Lo Trovador de Montserrat). The movement spread rapidly to Valencia, which produced the poet Teodoro Llorente, and to Majorca, the birthplace of the poets Gerónimo Rosselló (Lo Joglar de Mayorca) and Mariano Aguiló. In 1859, largely under the influence of Balaguer, there were re-established at Barcelona the old-time floral games (*jochs florals*), and popular enthusiasm was aroused throughout the whole Catalan territory. The initial period of this renaissance was thus completed, and a flourishing period was ushered in. Other floral games were established, notably those of Valencia, known as the *Jochs Florals del Rat-Penat*. Other names also attained celebrity: Jacinto Verdaguer, author of two epics, *Atlántida* and *Canigó* (both of which were crowned), and of the exceedingly attractive *Idilis y cants místichs*; and Angel Guimerà, the poet and dramatist, whose powerful drama, *Terra Baixa*, Mrs. Fiske presented to the American public in 1903 under the title *Marta of the Lowlands*. Although true to its principality in local color, the passions of this play are so universal that it has won a triumphant welcome in Serbia, Italy, France, Cuba, Mexico, and South America. We should remember, too, that on August 14 and 15 each year there is performed at Elche a celebrated religious play, comparable, *mutatis mutandis*, to the Passion Play of Oberammergau. This is the *Festa d'Elche*, whose present form (a seventeenth-century version) is modeled upon a fourteenth-century Catalan drama on the same subject. Consult, for Catalan language: Milá y Fontanals, *Estudios de lengua catalana* (Barcelona, 1875); Morel-Fatio and Sarrailh, in Grüber's *Grundriss der romanischen Philologie* (vol. i, Strassburg, 1904-06). For Catalan literature: Morel-Fatio, in Grüber's *Grundriss* (vol. ii, Strassburg, 1893); Denk, *Geschichte der altcatalanischen Litteratur* (München, 1893); and Fastenrath, *Catalanische Troubadoure der Gegenwart* (Leipzig, 1890); F. Blanco García, *Literatura Española en el Siglo XIX* (3 vols., Madrid, 1894, 1903, 1909), of which vol. iii contains a long study: *Literatura Catalana en el Siglo XIX*.

CAT'ALAU'NIAN PLAIN (Lat. *Campi Catalaunici*, named from the Gallic tribe of *Catalauni* or *Catelauni*). The ancient name of the wide plain surrounding Châlons-sur-Marne, in the old Province of Champagne, France, where the Visigoths and the Roman general Aëtius successfully encountered Attila in 451 A.D., thus arresting the westward progress of the Huns. A tradition (made the subject of a striking

picture by Kaulbach, "Die Hunnenschlacht," or 'The Battle of the Huns') tells that three days after the great fight the ghosts of the slain appeared on the plain and renewed the conflict. The battle, usually spoken of as the battle of Châlons, was probably fought at some distance from that city. See AËTIUS; ATTILA.

CATALDI, ká-tál'dé, PIETRO ANTONIO (1548-1626). An Italian mathematician. He was successively professor of mathematics in Florence (1563), Perugia (1572), and Bologna (1584), and is chiefly known as a pioneer in the use of continued fractions, the common form of which he invented (1613) and employed in the extraction of square roots. (See FRACTIONS.) His method, however, is more novel than practical and is quite inferior to that of Cardan. Besides a work on perfect numbers (1603), a treatise on Dürer's construction of regular pentagons (1620), and a three-volume edition of Euclid (1620-25), his chief works are: *Trattato del modo brevissimo di trovare la radice quadrata dei numeri* (1613); *Trattato dell'algebra proportionale* (1619); *L'algebra discorsiva numerale et lineare* (1618); *L'algebra applicata* (1622).

CAT'ALEPSY (Lat., from Gk. κατάληψις, *katalēpsis*, seizure, from *κατά*, *kata*, down + *λαμβάνειν*, *lambanein*, to take). A condition of partial or complete unconsciousness, in which the patient voluntarily assumes, or may be caused to assume, an attitude which he retains for several minutes. It occurs in hysteria or under the influence of hypnotism but is also seen in atonic melancholia and other psychoses. The patient may assume the attitude of attention, with hand and forefinger raised as if to command silence, or may raise the arm as if to protect himself, etc. In all instances the facial expression comports with the gesture, and the whole body remains rigid till the arm falls slowly by gravity and relaxation. If the subconscious condition lasts over a day, as in the cases occurring in insane patients, they must be fed with the stomach pump. Circulation, respiration, urination, defecation, and digestion continue normally. Trance, lethargy, and the sleep that is prolonged for days are all cataleptic states. It is within the range of possibility that this condition may be mistaken for death; but ordinary tests will easily decide, though the sensibility for pain or heat may be lost. In many cases the patients hear and respond to suggestion. All prolonged cases should be fed artificially, and close scrutiny will result in the detection of simulation in some instances. A pinch of snuff or an emetic, such as apomorphine, will sometimes abort or arrest an attack, or application of the faradic current may be effectual. In the intervals between attacks cold baths, tonics, and antispasmodic remedies are indicated, together with moral treatment. The immediate cause of catalepsy is unknown. Consult Dana, *Text-Book of Nervous Diseases* (New York, 1901).

CAT'ALINA. A town and port of entry on Trinity Bay, Newfoundland, 60 miles north-northwest of St. John's (Map: Newfoundland, G 4). It has a fine harbor of refuge, with a prominent lighthouse. Pop., 1700.

CATALOGUE OF SHIPS. A name commonly given to the passage in Homer's *Iliad*, ii, 494-878, in which the forces that fought at Troy, on both sides, are enumerated in detail.

CATALOGUING. The work of making cata-

logues and bibliographies, both of which deal with entire books as units. The cataloguing of books and literary material preserved in libraries is a matter of great importance. A large library contains a million or more different items, any of which may be wanted quickly by some reader. Much of the value of the collection depends on good catalogues, without which the material is of little more practical value than so much "pi" in a printing office. The seeker for some specific book may ask for such a work by such an author, or for a work of which only the subject is known, while not infrequently a reader has in mind some book which he has seen but of which he can give accurately neither author, title, nor subject, remembering merely some accident of language, size, binding, date, illustrations, or the literary form in which the subject is treated. While some libraries make many special catalogues and lists to enable them to answer unusual questions, only two catalogues are essential to meet all reasonable demands—that by authors and that by subjects. Most other questions can, by double reference, be answered by bibliographies, digests, and indexes, by finding in what book the desired matter is printed and then consulting the catalogue to see if the library contains that book. See **BIBLIOGRAPHY**; **DIGEST**; **INDEX**.

The title of every book in a library has three essential parts: (1) author; (2) title proper (as copied from the title-page or condensed by the omission of unimportant matter but never by rewording); (3) imprint and collation, or place, publisher, date, volumes, pages, illustrations, price, or other bibliographic details. The addition of descriptive notes, giving contents, standpoint of author, form of treatment or other facts, in the most condensed form, is a modern improvement, gaining ground with great rapidity, as it has proved a most substantial aid in getting into a reader's hands the work that is most valuable to him. Catalogue entries may be in manuscript or printed and may be either in book form or on separate cards or slips standing on edge in drawers or trays. Titles can be typewritten with recent improvements quickly and cheaply, and the greatly increased legibility and uniformity insure that hereafter most titles not regularly printed will be machine-written. In recent years there has been rapid increase in the number of libraries that print titles.

Coöperative Catalogues. Since 1876 the American Library Association has conducted numerous experiments seeking the great practical economy to be had from cataloguing a book in some central bureau, printing cards, and distributing them to all libraries buying that book, thus securing the highest grade of catalogue work and reducing cost in the department where it is most felt. The Library of Congress in 1901 took up the systematic preparation and printing of cards which are sold at two cents each for the first card and \$0.007 for additional copies. Through this agency catalogues have been immensely improved and their cost much reduced. The great expense of satisfactory cataloguing is the item oftenest criticized, because least understood. The public now properly demands not only convenient guides to the best books, but also analyses of their contents. If what a reader needs is found in an article or chapter, it is just as important that he should be guided to it as to an entire book. The pub-

lishing board of the American Library Association, endowed by Andrew Carnegie, is constantly preparing practical aids to readers for the common use of libraries, utilizing the experience of all libraries and focalizing and publishing the results for the benefit of all. George Iles of New York has borne the cost of much of this work and made possible several most valuable guides to readers.

The most helpful of these books is the *A. L. A. Catalog*, a classified and indexed list of the 8000 volumes most valuable for an average town library. This was originally prepared in the New York State Library, published by the United States Bureau of Education in 1893 for the Columbian Exposition, and while lacking the most important element, the notes, was of great service. A new edition was undertaken for the St. Louis Exposition with the director of the New York State Library as editor, in coöperation with the leading libraries of the country. The list gave not only the selection which represented the experience of prominent experts in books throughout the country, but notes were added to show in the fewest words the scope, character, and value of each book. The book thus prepared was published by the Library of Congress in 1904. A Supplement covering the years 1904–11 was published by the American Library Association in 1912. Many libraries use it as a catalogue, marking copies to show what is on their own shelves.

Catalogue Rules. Rigid adherence to a definite code of elaborate rules is necessary to secure satisfactory results. Repeated efforts by eminent scholars to get on without what they thought needlessly formidable codes of rules have uniformly resulted in failure. The three most important English codes are those of the British Museum, the Bodleian, and the Library Association of the United Kingdom. These are printed together by the New York State Library School as *Bulletin No. 13*. For instruction in library schools, all these rules have been carefully digested, revised and edited, with additions for accession and shelf work, and printed in a single volume as *Library School Rules* (Boston, 1894). Cutter's *Rules for a Dictionary Catalogue* (3d ed., Washington, 1904) was long the recognized authority and indispensable guide for that form of catalogue. Its authoritative position has more recently been taken by the *Catalog Rules of the American and British Library Associations* (Boston, 1908). With these should be used the American Library Association list of subject headings for use in dictionary catalogues, with hints on subject cataloguing and schemes for subheads under countries and other subjects (Chicago, 1912).

Shelf Lists. As practically all libraries are adopting close classification on the shelves, the shelf list, which is an inventory of the books as they stand on the shelves, becomes very useful as a subject catalogue. This list gives the class, book, and accession number, with very brief author and title. It is used for taking the annual inventory and is the most convenient short-entry classed catalogue. It is usually written on loose sheets laced into a binder so that sheets can be inserted or recopied as necessary, but may be written on cards.

Book versus Card Catalogues. While readers ordinarily prefer the book form, cards have practically superseded book catalogues. All libraries increase rapidly, and a new title

cannot be inserted in the book catalogue, while titles may be added at any moment to the card catalogue, thus keeping it absolutely up to date. A book catalogue of a growing library is out of date before it can be bound and delivered, and most libraries have adopted the card form, because it avoids entirely the necessity of rewriting as subjects grow.

Plan of Catalogue. The Author Catalogue is commonly found in all libraries. Authors are arranged in strict alphabetic order, as are the words of a dictionary, and under each author are further arranged alphabetically by titles all works by him which the library possesses. A separate title catalogue is rarely made; yet title cards are generally made for anonymous publications, and also for books having titles specially likely to be remembered. These are usually inserted in the same alphabet with authors. The Subject Catalogue also has now come to be regarded as essential. It alone can tell what the library has on any subject, and obviously its educative value is very great. There are three distinct types: 1. *Classed*.—This has all subjects arranged in logical order and to be conveniently usable must employ a system of notation with numbers or letters referring to each specific subject, and an alphabetic index where the most minute topic will be found followed by this number. 2. *Alphabetico-classed*.—In this the main subjects are in alphabetic order, and under each in subalphabets are divisions and sections, so that the catalogue is its own index. Cross references may be inserted at any point, so that a topic can surely be found from the main alphabet without a subordinate index. 3. *Dictionary*.—This is now the most common type of catalogue, and its use has been growing steadily for a generation. It introduces specific subject entries in the same alphabet with authors and titles, thus making simple dictionary order. The easy rule to consult it like a dictionary, whether author, title, or subject is sought, appeals strongly to most readers. In spite, however, of its apparent simplicity, it requires the greatest skill to make, and while unexcelled for reference to a single topic, which is the most common need in popular libraries, in its nature it cannot put before the reader the resources of the library on generic subjects with the clearness or helpfulness of the classed catalogue.

If one wishes to see all the geometries in a library, direct reference to this word under G in the dictionary catalogue gives them as well as would similar reference to "Geometry" in the classed catalogue, but in the dictionary form these are preceded by, e.g., "Geology" and followed by "Geoponicon in sermonem Syriacum versorum quæ supersunt." In the classed catalogue, however, geometry is preceded by algebra and arithmetic and followed by trigonometry, calculus, and the other subjects most nearly related. If one wishes to see the mathematical collections of the library, he must look in the dictionary catalogue under a dozen distinctly different heads to collect his titles, while in the classed catalogue they stand close together in logical order. If one makes a dictionary catalogue under the simple rule to write the apparent subject at the head of the card and drop it into alphabetic order, the result will be largely worthless. It requires, like the classed catalogue, a carefully elaborated system worked out in advance and scrupulously fol-

lowed, otherwise books on the identical subject will be scattered all over the alphabet by the accident of the first word or of the word that happened to be in the cataloguer's mind when writing the headings. A book discussing protection and free trade might appear under P, F, or T, or under Tariff, Revenues, Subsidies, Customs, Duties, or other heads. All things considered, the merits of the two systems are well balanced. In the smallest library the classed list appeals strongly to teachers and others interested in the educational work of the library, because they know what its influence will be on inexperienced readers. In large libraries the classed form appeals to students who study not only specific but generic subjects, and appreciate the advantages possible only with an arrangement which follows the natural relation of subjects to each other. Some of the largest, and practically all the smaller, American libraries employ, however, the dictionary form of catalogue.

Bibliography. Blackburn, *Catalogue Titles, Index Entries* (London, 1884); Cutter, *Rules for a Dictionary Catalogue* (Washington, 1904); Dewey, *Simplified Library School Rules* (Boston, 1899); id., *Decimal Classification* (Lake Placid, N. Y., 1913); Linderfelt, *Eclectic Card Catalogue Rules, Author and Title Entries* (Boston, 1890); Quinn, *Manual of Library Cataloguing* (London, rev. ed., 1913); Wheatley, *How to Catalogue a Library* (ib., 1889); Richardson, *Classification, Theoretical and Practical* (New York, rev. ed., 1913); Hitchler, *Cataloguing for Small Libraries* (Boston, 1905); Library of Congress, *A. L. A. Catalog* (Washington, 1904); *Supplement* (Chicago, 1912); *Catalog Rules; author and title entries, compiled by committees of the A. L. A. and the L. A.* (Boston, 1908).

CAT'ALO'NIA (Sp. *Cataluña*, Fr. *Catalogne*, ML. *Catalonia*, for *Gothalanía*, from *Gothus*, Goth + *Alanus*, Alan). An old independent principality of Spain, later also a principality of the crown of Aragon, occupying the northeast corner of the kingdom, and bounded by France on the north (with the Pyrenees on the border) and the Mediterranean on the east and southeast (Map: Spain, F 2). Area, 12,430 square miles, comprising the modern provinces of Barcelona, Tarragona, Lérida, and Gerona. The coast is rugged and well indented. With the exception of a few low plains of limited extent, the surface of Catalonia is that of a wild, mountainous region, formed by numerous outliers or terraces of the Pyrenees, and by one great ridge or series of ridges extending through the centre of the district in a general southern direction. The chief rivers are the Segre, the Ter, the Llobregat, and the Ebro, all flowing into the Mediterranean and none navigable except the Ebro. The climate of Catalonia, in spite of its unsteadiness and the prevalence of fogs and rain, is, on the whole, healthful and favorable to vegetation. Near Barcelona oranges flourish in the open air; the fields in some parts are bounded by aloe hedges, and olives are found on Montserrat. Cork trees grow on the mountains, and thickets of thorn apple, laurel, myrtle, pomegranate, box, rosemary, etc., extend where the cork has no growth. Northern Catalonia has a more severe winter than the southern portion, but everywhere vineyards and olive gardens cover the slopes, and cornfields extend in the valleys. Among the other products are hemp,

flax, madder, barilla, and saffron. Hazelnuts, a variety called Barcelona nuts, are extensively grown. Meadowlands and pastures are comparatively rare, and horned cattle are, therefore, mostly confined to the districts bordering on the Pyrenees. Horses and mules are reared to a limited extent, but sheep, goats, and swine are bred in considerable numbers. Silkworms and bees also thrive. The coasts abound with fish, and game is plentiful. The minerals are coal, copper, manganese, zinc, lead, cobalt, salt, sulphur, and many varieties of marble. Catalonia is the principal manufacturing and commercial part of the kingdom and has the best transportation facilities in Spain. The leading manufactures are cotton, silk, woolen goods, paper, arms, etc. The principal city and the capital is Barcelona. Pop., 1887, 1,838,799; 1900, 1,966,382; 1910, 2,084,868. The Catalonians are a mixed people, having the combined features of Iberian and Goth; are of low stature, dark brunette in color, with wide, projecting foreheads, and dark hair and eyes (cranial index, 77.7-78.1; French Catalans, 78.6). (Ripley, *Races of Europe*, New York, 1899.) Catalonia has been in touch with most of the ethnic elements of western Europe. Upon its Iberian stock have been grafted the mixed race of Romans, the Scythian Alans, the Teutonic Goths, the Semitic Arabs, and the Alpine Franks. No doubt their progressive vitality is due to the mixture. In energy, industry, and intelligence they greatly surpass the rest of the Spaniards.

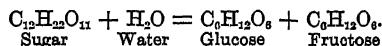
Catalonia, under the name of Hispania Tarraconensis, constituted a part of Roman Spain. It was invaded and subdued by the Alans, and, after them, by the Goths, who gave the country the name of Gothalandia, changed in the course of time to Catalonia. In the eighth century the Arabs gained possession of the southern part. When Charlemagne, in 788, subjugated Spain as far as the Ebro, Catalonia formed the central portion of the Spanish mark governed by Frankish counts who had Barcelona as their residence. They soon made themselves independent of France. In 1151 Earl Ramon Berenguer, by his marriage with the Princess Petronilla (1137), united Catalonia with Aragon, to the future greatness of which Catalonia contributed in a very great measure by reason of its wealth and the influence wielded by the citizens of Barcelona, its capital, in the western Mediterranean. See SPAIN, paragraph on *History*; CATALAN LANGUAGE AND LITERATURE. Consult: Bori y Fontestà, *Historia de Cataluña* (Barcelona, 1898); Balari y Jovany, *Orígenes históricos de Cataluña* (Barcelona, 1899); *Cataluña, sus monumentos y artes, su naturaleza y historia* (which appears in 2 vols. in the illustrated series *España*), by P. Pifferrer, F. Pi y Margall, and A. A. Pijoan (Barcelona, 1884); and V. Balaguer, *Historia de Cataluña* (11 vols., Madrid, 1886, etc.).

CATALPA (Amer. Indian). A genus of trees of the family Bignoniaceae. *Catalpa bignonioides* is a native of the southern portion of the United States and is cultivated there and in the cities of the Northern States as an ornamental shade tree. It may be known by the silver-gray bark, widespreading but few branches, and large, pale-green, heart-shaped leaves. The flowers are white, tinged with violet or purple, and dotted with the same colors. They are succeeded by long, beanlike pods, that sometimes hang on the otherwise bare limbs all

winter. The seeds are winged, the wings cut into a fringe. The wood is light and of fine texture, and useful in cabinetwork. (For illustrations see Plate of CALABASH, ETC.) A second species, *Catalpa speciosa*, is a larger and more hardy tree, indigenous in the United States from Indiana to Tennessee, and west through Arkansas and Missouri. It is readily distinguished from the former species by its thicker bark, and the flowers being very inconspicuously tinged or spotted. In rich lowlands this tree makes a very rapid growth, and it has been very successfully planted in Kansas and Oklahoma for its timber, the wood being valuable for railroad ties, posts, etc. In favored localities it is hardy in Minnesota. Other species are known from Japan and China.

The catalpa is subject to a leaf-spot disease, caused by *Phyllosticta catalpa*, that sometimes causes the leaves to become brown and ragged and, as the disease progresses, brings about the partial defoliation of the trees.

CATALYSIS (coined by the Swedish chemist Berzelius, from Gk. *katá*, *kata*, down + *λύειν*, *lyein*, to loose). The furthering or hindering effect exerted upon chemical reactions by various substances and not accounted for in the usual chemical equations. A classic case of catalysis is the so-called "inversion" of ordinary cane sugar by water and acids. This reaction is represented by the equation:

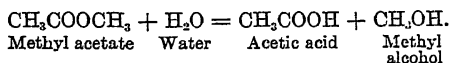


This might lead one to think that when cane sugar is dissolved in water, a chemical change sets in, resulting in the formation of the two simple sugars, glucose and fructose. In reality this change does not take place—at least (under ordinary conditions) not to any measurable extent—unless *acid* also is present. When the reaction is over, the acid is found to have itself undergone no change; not the slightest fraction of it has been used up. This is why the acid does not figure in the above equation. Yet, as stated, the reaction would not take place without it. And so, in accordance with the definition, we recognize the furthering effect of acids upon sugar inversion as catalytic, and we speak of the acids themselves as catalyzers, catalysts, or catalytic agents. Formerly catalysis was often spoken of as "contact action," the belief being that the furthering substance exerts its remarkable effect, not by chemical interaction with the reagents, but by its mere contact with them.

The same reaction, sugar inversion, presents also an example of the opposite sort of effect, viz., of hindering catalysis, or, as it is generally called, *negative catalysis*, or anticatalysis. Without the presence of water, which is one of the reagents, the reaction is, of course, unthinkable. Yet Rosanoff and Potter were able to show that, besides being a reagent, water also plays the rôle of a negative catalyzer of the reaction: the more dilute the solution, i.e., the more water is present, the slower is the reaction.

It will be noted that a catalyzer is not necessarily a substance foreign to the reaction (as the acid in sugar inversion), but that one of the reacting substances themselves may play the double part of reagent and catalyzer (or anticatalyzer, as the water in sugar inversion). Catalytic action exerted by one of the reacting substances, or one of the products of the reac-

tion, is termed *autocatalysis*. The retarding effect of water on sugar inversion may be described as negative autocatalysis. An example of positive or furthering autocatalysis is presented by the hydrolysis of methyl acetate (the ester of methyl alcohol with acetic acid). The hydrolysis of esters is, like sugar inversion, greatly catalyzed by acids. If methyl acetate is dissolved in pure water, a slow reaction sets in as follows:



But the acetic acid formed furthers the reaction catalytically, as would any foreign acid that might be introduced to begin with. So the effect of acetic acid, which is both a product and a catalyst of the reaction, is classed as an autocatalysis. It is important to note that, according to the electrolytic dissociation theory (see DISSOCIATION; ELECTROLYTIC), the catalytic effect of acids is due to the free hydrogen ions present in their solutions.

As stated, the hydrolysis of esters takes place—slowly—in pure water. The presence of acids accelerates the process; but their absence does not preclude it. Wilhelm Ostwald, one of the leading thinkers on catalysis, believes that *all* catalytic phenomena are like this; that catalysis is always either an acceleration or a retardation of reactions, and never consists in rendering a reaction possible that could not take place at all without catalytic help. This view he forcibly expressed in an address at the time of receiving the Nobel prize in 1909. If questioned regarding sugar inversion, which appears not to occur in pure water, Ostwald would express the belief that inversion does take place in pure water, but so slowly that it cannot be detected. And as a matter of fact, in very hot water sugar inversion does actually set in, though even then at a barely appreciable speed.

Ostwald's conception of catalysis may best be grasped by comparing the occurrence of a chemical reaction with the flow of an electric current through a wire. The current is caused by the existence of a certain definite electromotive force; but the intensity of the current, i.e., the quantity of electricity that flows through the wire per unit of time, depends, for a given electromotive force, upon the electric resistance of the wire. Similarly, a chemical reaction may be considered as caused by the force of chemical affinity; but for a given affinity force the velocity of the reaction, i.e., the quantity of substance transformed per unit of time, depends upon the chemical resistance of the system. Just as the intensity of an electric current can be modified by changing either the electromotive force or the electric resistance, so the velocity of a chemical reaction might conceivably be modified by changing either the affinity or the chemical resistance. It is, however, a definitely established truth that foreign substances, including catalysts, can have no effect at all upon the affinity force of a reaction under certain ideal conditions, and but a slight effect under actual working conditions. Hence the great changes in reaction velocity often caused by catalysts can only be due to their affecting the chemical resistance. But, while the flow of electricity can be stopped altogether by making the resistance infinitely great (cutting the wire, as in switching out an electric light), the chemical resistance of a system, Ost-

wald would say, can never become infinite, and hence some slight chemical reaction will go on even in the total absence of catalyst. We have seen that in a hot aqueous solution sugar actually undergoes inversion even in the total absence of acids, although it must be borne in mind that water itself happens to be a very weak acid, so that the statement about the "total absence" of acids is not strictly true.

Keen as these ideas are, there is a grave defect attaching to them,—at least, in the present state of chemical knowledge—namely, nothing whatever is known about this "chemical resistance," and not the vaguest conjecture can be formed as to the mechanism by which catalysts might have a modifying effect upon it. While, therefore, Ostwald's theory has been far from fruitless, its capacity for scientific service is bound to be limited, after all. A different conception of "homogeneous" catalysis (i.e., where the catalyst mixes with the reagents to a homogeneous solution) has been worked out by Rosanoff, on the basis of an extensive series of experimental researches. According to this new theory, there are two distinct kinds of catalysis and catalysts—chemical and physical, or direct and indirect. A chemical or direct catalyst really takes part in the reaction. In many cases, at least, its particles combine with those of one or more of the reagents into molecular complexes, and it is these that undergo the change involved in the given reaction. It is not all parts, however, of the complex molecule that undergo change: the part constituted by the catalyst remains unchanged, and only the parts contributed by the "reagents" disappear, to give place to products of the reaction. But then, since the usual chemical equation of a reaction can keep account only of the net final changes, and not of the participation of substances that finally reappear unchanged, the participation of the catalyst is not recorded by the chemical equation. A chemical catalyst is thus really itself a reagent, but a reagent that happens to be re-formed in the reaction. Like every other reagent, it must obey the law of chemical mass action (see REACTION, CHEMICAL); i.e., the velocity of the reaction must be proportional to the concentration of the catalyst (or to some power of that concentration). If that concentration is zero, the velocity of the reaction, too, must be zero: the reaction will not take place at all. In contradiction to Ostwald's general principle, a chemical catalyst will, therefore, not merely *hasten* the reaction, but render it *possible*.

A physical or indirect catalyst, according to Rosanoff's theory, does not itself take part in the reaction. It affects the speed of the reaction indirectly, by influencing the molecular condition of the reagents proper. Let, for instance, a given reaction depend for its occurrence upon the formation of a molecular complex. Then any soluble substance of high associating power, i.e., favoring the formation of complex, associated molecules, will hasten the reaction; i.e., it will act as a positive catalyst. Any substance having high dissociating power, and therefore tending to disrupt the complex molecules upon which the reaction depends, will appear as a negative catalyst. The effect will obviously be reversed in the case of a reaction that is furthered by the *dissociation* of molecules. It has long been known that one and the same reaction may take place rapidly in one sol-

vent and slowly in another. From the viewpoint of the theory under consideration, all such "solvent-catalysis" or "medium-catalysis" must be classed as physical or indirect catalysis. And if something is known, on the one hand, of the mechanism of a given reaction and, on the other hand, of the associating or dissociating power of a given set of soluble substances, the theory permits of foretelling which of the latter will act as positive and which as negative catalyzers. Experiment has borne out these ideas in all cases thus far examined, so that, for the first time in the history of the subject, the possibility is established of foreseeing the catalytic effect of substances before actual trial has been made.

Rosanoff and his collaborators have further found that physical or indirect catalyzers obey, not the law of chemical mass action (as do the chemical or direct catalyzers), but what is known in mathematics as the compound-interest law. Accordingly the percentage increase or decrease in the speed of a reaction is proportional to the amount of physical catalyzer added, and in the absence of the catalyzer the speed is by no means zero; if it were, then no amount of catalyzer could create an appreciable speed. Physical catalyzers, therefore, and only these, obey Ostwald's principle that catalyzers merely increase the speed of a reaction, but do not bring about reactions that could not at all occur without them.

It must, however, be borne in mind that the theory just outlined applies, as already stated, only to homogeneous catalysis, i.e., to those cases in which the catalyzer forms a homogeneous solution with the reagents and other substances that might be present. Some of the most important cases belong, not to this, but to the "heterogeneous" class. Thus, the combination of sulphur dioxide with oxygen to sulphur trioxide (from which sulphuric acid is now made on the largest industrial scale) is catalyzed by passing a mixture of the two *gases* over metallic platinum, ferric oxide, or certain other *solids*. Similarly, as Sabatier and Senderens have shown, a great variety of organic compounds can be reduced by passing their vapors mixed with hydrogen over finely divided metals, particularly nickel. In recent years this method has been modified in that the nickel is introduced into *liquids* to be reduced, the hydrogen gas being pumped in under pressure. Liquid vegetable oils, like cottonseed oil, are now commercially reduced in this manner to solid fats (like "Cresco") for culinary purposes. Again, ammonia (q.v.) is now manufactured synthetically from nitrogen and hydrogen by heating a mixture of the two gases over metallic iron. In this latter case, by the way, it has been found that substances like lime, common salt, and other salts, while not catalyzers themselves, greatly enhance the catalytic action of the iron. They have been called "promoters"; but their effect is even more mysterious than that of the catalyzer itself.

To mention one more celebrated case of heterogeneous catalysis, the combination of hydrogen and oxygen is greatly catalyzed by metallic platinum and to a lesser extent by various other solids, including glass. Other substances, too, are set burning (combining with oxygen) under the catalytic influence of platinum. Thus, lighters for illuminating gas have been made of small masses of finely divided platinum placed

near the outlet of gas burners; unfortunately, these devices rapidly deteriorate, owing to the platinum catalyzer being "poisoned" by the sulphur compounds contained as impurities in illuminating gas. Such "poisoning" of catalyzers is a very frequent phenomenon, and in the industries mentioned above no pains are spared in purifying the gases which are to be brought into contact with the catalyzing metals.

Perhaps Faraday was correct in assuming, in 1833, that in heterogeneous catalysis the reaction takes place near the surface of the solid, in the layer of "condensed" gas which adheres so tenaciously to solids that the removal of all air or moisture from a solid surface is a matter of the greatest difficulty. Berthelot, and many others, have believed that, at least in the catalysis of gaseous reactions by metals, the latter form true chemical compounds with one of the gases (such as hydrides with hydrogen), and that it is these "intermediate compounds" that yield the reaction products by further reacting with the other gases involved. But really nothing definite is known on the subject, and no single theory as yet advanced seems capable of adequately elucidating the chaotic variety of phenomena of heterogeneous catalysis.

In conclusion, mention must be made of some remarkable catalytic effects produced by the merest traces of moisture. As far back as 1794, Mrs. Fulhame, a brilliant English chemist, showed that carbonic oxide (carbon monoxide) will not combine with oxygen unless the gases are moist. The phenomenon was demonstrated anew, and with convincing thoroughness, by Dixon in 1884. Both Mrs. Fulhame and Dixon believed that the carbon monoxide reacts with the water (moisture) chemically, liberating hydrogen, which in turn combines with the oxygen, re-forming the original amount of water. If this is correct, then, from the viewpoint of Rosanoff's theory, the moisture effect would be classed as a chemical catalysis. A number of other cases in which perfectly dry substances refuse to interact were described in 1894 by Baker. For instance, ammonia and hydrochloric-acid gases, which ordinarily combine promptly, forming white fumes of ammonium chloride, refuse to combine if thoroughly freed from moisture.

Bibliography. The literature of catalysis is very extensive, and Ostwald is undoubtedly right in his belief that catalytic phenomena are quite general, that every reaction can be catalyzed by some substance, and that every substance can catalyze some reaction. A great number of catalytic phenomena are mentioned in Gertrude Woker's *Die Katalyse* (Stuttgart, 1910). Chapters on catalysis will be found in every general work on physical chemistry or chemical dynamics, e.g., in Mellor's *Chemical Dynamics* (London, 1909). Consult further: Mrs. Fulhame, *An Essay on Combustion* (London, 1794); Ostwald, "Ueber die Katalyse," in *Zeitschrift für Elektrochemie*, vol. vii, for 1901; also in *Nature*, vol. lxx, for 1902; Rosanoff, "Outline of a Theory of Homogeneous Catalysis" in *Journal of the American Chemical Society*, vol. xxxv, for 1913. See also ENZYMES.

CAT'ALYTIC ACTION. See CATALYSIS.
CAT'AMARAN' (Fr. *catamaron*, Hind. *kaṭamaran*, Malayalam *kaṭamaram*, logs bound together, from *kaṭa*, binding, from *kaṭṭa*, to bind + *maram*, timber). In its original form, a craft consisting of three logs—the middle one being

longest—lashed together. It was used by the natives of the Coromandel coast, particularly Madras; also in the West Indies and on the coast of South America. The Fiji Islanders developed this idea in their war canoes, which consist of two parallel logs joined together with a platform, on which a mast is placed. These boats are safe and very swift, having a speed of about 14 miles an hour. This, again, is surpassed by the flying proa of the Ladrone Islanders, a boat with two hulls of unequal size. The larger hull, which carries all the rigging, is perfectly flat on one side and rounded on the other. On this are placed bamboo poles projecting beyond the rounded side, and to their ends is fastened a boat-shaped log one-half or one-third the size of the larger hull. This prevents capsizing as effectually as the Fiji double canoe. Both ends of the proa are made alike, and the boat is sailed with either end first; but the outrigger is always to windward. Against a head wind the proa is kept away till the stern approaches the wind, when the yard is swung round, and what was the stern becomes the bow. Proas are from 40 to 65 feet long and 6 or 7 feet wide, and are said to attain a speed of 20 miles an hour.

Double boats, or catamarans, have often been built in the United States, but have almost always proved very slow, because the water between the two bows is compressed into a narrowing space and offers great resistance. This defect is illustrated in the English twin steamer *Castalia*, which, in spite of her great engine power, was a slow boat. Another example of the steam catamaran was the *Henry W. Longfellow*, built about 1880. Two iron cylinders 200 feet long, shaped like cigars, sharp at both ends, were fastened to each other at a distance of 9 feet. On them rested a deck 125 feet long, like a ferryboat. She could carry 475 passengers, had 500 horse power, a displacement of 75 tons, and her entire weight was only 43 tons. In 1876 the *Amaryllis* was designed and built by Herreshoff. She consisted of two slender tubes connected by crossbeams loosely fastened together, and supporting a deck hardly more than large enough for two men. She was entered at the Centennial Regatta at New York, and easily beat all competitors, but was ruled out on account of her construction. In spite of her great speed, she was very uncomfortable and very unsafe. In 1877 Herreshoff patented a double-hulled boat combining the greatest stability with the least weight. The hulls were united by ball-and-socket joints, which obviated the unevenness in position of the two hulls in a rough sea, and were set 16 feet apart, each having a centreboard and rudder. The boat had a sloop rig, and with a strong wind abeam and a smooth sea made 20 miles an hour. Many catamarans have been built since, but generally with rigid connections, and prove unsatisfactory in rough water. In a racing catamaran 25 feet long, the proportion is 1 foot canvas to 8 pounds of water displacement. This shows the sailing powers of the catamaran. If in construction iron cylinders were used, in shape like the hulls of the flying proa, and placed with the flat sides towards each other, great speed would be secured with safety. Under proper conditions the catamaran is well adapted to summer sailing in smooth waters, being easy to handle, fast, and safe. In the United States navy the term "catamaran" is sometimes applied to the balsa

(q.v.), or to a float used for the men who clean the ship's side along the water line.

CATAMARCA, ká'tá-mär'ká. A province in the northwest part of Argentina, lying at the foot of the Andes and occupying an area of 47,444 square miles (Map: Argentina, D 9). The province is intersected by several mountain chains and by many small streams, most of them dry in the summer, but overflowing in the winter. It contains a number of salt lakes. The valleys in the mountainous parts are very fertile. Gold, silver, and copper are found, the latter in abundance, and nearly all the fruits and grains of tropical and temperate regions are grown. Pop., 1895, 90,161, mostly Indians; 1905 (est.), 104,228; 1910 (est.), 110,317. Capital, Catamarca.

CATAMARCA. The capital of the Province of Catamarca, Argentina, situated in a mountainous region in the extreme northwestern part of that country, about 250 miles northwest of Córdoba (Map: Argentina, D 9). It is regularly and moderately well built and contains a fine town hall, a Franciscan monastery, a national college, and a normal school for women. There are considerable imports of European goods, and the place is a centre of distribution for a flourishing district. Dried figs, wines, brandy, and cotton are the principal articles of export, together with the curious form of embroidery for which the women are celebrated. The town was founded in 1683. Pop., 1899, 7397; 1905 (est.), 8000, a large percentage of which are mestizos.

CATAMENIA. See MENSTRUATION.

CATAMOUNT (also *catamountain*, for *cat o' mount*, *cat o' mountain*). An indefinite term for a wild cat or panther, formerly much used in the United States (and as *gato monte* in Spanish-speaking America), but now rarely heard.

CATANA. See CATANIA.

CATANIA, ká-tá'ně-á (Gk. *Katάνη*, *Katane*, Lat. *Catina*, and, less correctly, *Catana*). An episcopal city and seaport on the east coast of Sicily, at the southeast base of Mount Etna, 59 miles south-southwest of Messina and 5 miles west-northwest of Syracuse (Map: Italy, K 10). It is the capital of the Province of Catania, and the third largest city in Sicily, being outranked in population by Palermo and Messina. In front of the cathedral is a fountain, with an ancient statue of an elephant, made of lava, bearing an Egyptian granite obelisk. In the cathedral, begun by Roger I in 1091 with materials taken mostly from the ancient theatre, and of the original of which little besides the choir has been spared by earthquakes, is the chapel of Agatha, tutelary saint of Catania, who was martyred in 252 (legendary), and whose festival is celebrated February 5. In the cathedral also is the monument of the composer Bellini, a native of Catania. The Villa Bellini has an attractive garden, containing busts of Bellini and others, and a statue of Mazzini.

In summer Catania is hotter than Palermo, but in winter it is cooler, on account of the snow on Mount Etna. The city formerly had epidemics of cholera, but the sanitary conditions are now excellent and the water supply is good. The lack of promenades and gardens renders Catania less attractive to tourists than most Italian cities, although the streets are so broad and well kept, the private and public buildings so large and well built, and the situa-

tion so attractive, that it is commonly called "la bella." The chief attraction is Mount Etna, which may be seen to a good advantage from the tower of San Nicolò and from the Villa Bellini.

The remains of the ancient theatre, being mostly underground, can be inspected by torch-light only. The Roman structure was erected on the foundation of the Greek edifice, which is perhaps the one in which Alcibiades' eloquence, in 415 B.C., induced the Catanians to ally themselves with Athens against Syracuse. Another ancient Roman structure is the adjacent church of Santa Maria Rotonda. The Benedictine monastery of San Nicolò, formerly one of the most beautiful in Europe, was destroyed by an earthquake in 1693 and rebuilt by 1735. The institution was suppressed in 1866. The building has since been used for military and educational purposes. Its grand baroque church contains a famous organ by Donato del Piano, with 5 keyboards, 72 stops, and 2916 pipes; the museum contains antiquities in pottery, bronze, and marble, mediæval armor, and natural-history specimens; the library contains 50,000 volumes and 500 manuscripts, and the observatory is associated with that on Mount Etna. Under the Carmelite Church dell' Indirizzo is an ancient Roman bath almost completely preserved, and not far from it is a spring probably fed by the underground Ameneus, that emerges just before emptying into the harbor. The university (founded in 1445) has (1914) 1200 students (formerly over 2000), a school of pharmacy, a library of over 130,000 volumes (founded in 1755), and a fine collection of shells. The Academy of Natural Sciences (founded in 1823) has always been active in promoting the investigations of naturalists in Sicily.

The surrounding country, on account of its fertility, has been called the "granary of Sicily," and produces grain, hemp, flax, silk, cotton, wool, licorice, fruit, wine, and oil. It also has sulphur and salt mines and marble quarries, and Mount Etna supplies snow. The fisheries are extensive. The principal manufactures of Catania are linen, cotton, and silk goods, and objects in lava, wood, marble, and Sicilian amber. The terra-cotta figures of Sicilian peasants are interesting. Commercially the city is active, is a residence of a United States consul, and has regular communication by steamboat with the other ports of Sicily and of Italy, and with the eastern Mediterranean.

The classic Catana was founded by Greeks from Chalcis about 729 B.C. and soon became prosperous. Here, in the sixth century B.C., died Stesichorus (q.v.). In 476 B.C. its inhabitants were removed to Leontine by Hiero I, who named the town Ætna and gave it a new population of Syracusans and Peloponnesians, who were, however, expelled in 461 B.C. by the original inhabitants. In the war between Athens and Syracuse Catania was the Athenian headquarters. In 403 B.C. it was sacked by Dionysius; in 396 B.C. it was captured by the Carthaginians; it was one of the first Sicilian towns acquired by the Romans (263), under whom it flourished greatly. It suffered during the Servile and the Civil wars. It was taken from Belisarius by the Goths, plundered by the Saracens, fortified by the Normans, and in 1169 A.D. almost destroyed by an earthquake. Being restored and in 1232 equipped by Frederick II with the fortress of Rocca Orsina, it flourished

under the Aragonese rulers of the fourteenth century. On March 8, 1669, in a terrific eruption of Etna, a stream of lava turned its course from the town to the harbor, which it partly filled up. Catania also suffered greatly from the earthquake of 1693. The ancient ruins were excavated by Prince Biscari in the eighteenth century, and his collections, studied by Goethe in 1787, can be seen in the town, in the Museo Biscari. Pop., 1881, 100,000; 1901, 149,295; 1911, 211,699.

CATANIA. A gulf on the east coast of Sicily, extending in the form of a semicircle from Acireale to Cape Santa Croce, near Augusta, a distance of 18 miles (Map: Italy, K 10).

CATANO. A village of Porto Rico in the municipality of Bayamon, opposite San Juan (Map: Porto Rico, E 2). Pop., 1899, 2331; 1910, 4786.

CATANZARO, kă'tân-zü'rô. An episcopal city in south Italy, capital of the province of the same name, situated on a rocky hill, 8 miles from the Gulf of Squillace (Map: Italy, L 9). The climate being cool and healthful in summer, many wealthy families reside here. The town contains a castle, built by Robert Guiscard, a museum, and a cathedral. The country is luxuriant with olive groves, and the town has silk and velvet factories. Pop., 1901, 32,000; 1911, 34,103.

CATAPHORESIS. A method of introducing drugs into the body through the skin by means of an electric current. A pad wet with a solution of the desired drug is placed over the part and connected with the negative pole of a galvanic battery, the positive pole being applied to another portion of the body. Local anæsthesia may be thus produced by the use of cocaine or a similar drug. Rheumatic joints may be treated by solutions of sodium salicylate or potassium iodide in the same way. The method is also called ionic medication. See IONIZATION.

CATAPLASM. See POULTICE.

CATAPULT (Lat. *catapulta*, Gk. *καταπέλτης*, *katapeltēs*, from Gk. *κατά*, *kata*, down + *πάλλειν*, *pallein*, to brandish). An engine of war used in ancient times for projecting stones, long darts, or javelins. There were different kinds and sizes of catapults, to which various names were given. The catapult was less powerful than the ballista, but more uniform in its range. Catapults were used occasionally in the latter part of the eighteenth century. There was one erected at Gibraltar during its siege by General Melville, for the purpose of throwing stones a short distance over the edge of the rock in a particular space frequented by the Spaniards where they could not be annoyed by shot or shell. For illustration, and its position in the development of artillery, see ARTILLERY.

CATARACT. See WATERFALL.

CATARACT (Fr. *cataracte*, Lat. *cataracta*, from Gk. *καταρράκτης*, *katarrhaktēs*, waterfall, from *κατά*, *kata*, down + *ρηνύναι*, *rhēnynai*, to break; or less probably from *ἀράσσειν*, *arassein*, to dash in pieces). An opaque condition of the lens of the eye or of its capsule. It is readily distinguished from opacities of the cornea by its position behind the pupil. Cataract is called *primary* when independent of other disease of the eye, and *secondary*, or complicated, when the reverse is true. The opacity of the capsule of the lens or of the lens itself, following opera-

tions for cataract, is known as secondary or after cataract. Cataract may affect the lens alone (*lenticular*), or the front or back of the capsule of the lens (*capsular*), or both lens and capsule (*capsulo-lenticular cataract*). A cataract is *partial* when limited to a portion of the lens; *complete* when involving the whole; *stationary* if it remains partial; *progressive* if it tends to include the entire lens. Cataracts may be either *senile*, *congenital*, *juvenile*, or *traumatic*.

Cataract is painless and unaccompanied by inflammation. It occasions blindness simply by obstructing the passage of the light, but even in complete cataract the patient can distinguish light from darkness. Cataract is accurately detected by concentrating light upon the eye and illuminating its interior by means of the ophthalmoscope, the eye being previously dilated by some mydriatic, such as atropine or homatropine.

No medical or other treatment has any influence in arresting the progress of cataract, nor can it be cured except by surgical operation.

Traumatic cataract results from a perforating wound of the capsule of the lens. The entire lens becomes opaque, and a portion of it usually remains so; but at times, unless inflammation of other portions follows, the cloudiness entirely disappears. Congenital cataract is due to imperfect development or intrauterine inflammation. Juvenile cataract may be hereditary, or its cause unknown. In both congenital and juvenile cataract the lens is soft and white. They are treated by "needling," an operation in which a needle-like knife is employed to cut and break up the lens at several operations. The injured lens is then absorbed. Senile cataract, the most important form, usually occurs in persons over 50, and generally involves both eyes. Its period of development may be a few months or many years. Beginning in the form of dark streaks extending from the periphery towards the centre of the lens, or as spots in any portion, it eventually renders the entire lens opaque. As the fluid of the lens is then absorbed, it becomes easily separated from its capsule, and is considered mature, or "ripe" for operation. Later, if not extracted, the lens undergoes degenerative changes, or liquefies, and the capsule becomes thickened and opaque, making the results of operation less satisfactory. The only method of relieving senile cataract is extraction of the lens, with or without excision of a portion of the iris (iridectomy). The cornea is opened along a little less than half its circumference, the capsule of the lens is cut, and the lens is expelled by gentle pressure. The lens may be extracted in capsule, a method practiced by Major Smith, of Jollundur, India, in many thousands of cases. The method is considered by American operators too hazardous for general use. Great care must be used in the dressing and later treatment to avoid accidents. After removal of the cataract, the natural lens being absent, its place must be supplied by strong glasses. The power of accommodation is lost. Consult: Herbert, *Cataract Extraction* (London, 1908); Smith, *The Treatment of Cataract* (London, 1910); Woodruff (ed.), *Symposium on the Extraction of Senile Cataract* (Cleveland, 1912).

CATARMAN, kü'tär-män'. A town of Samar, Philippines, situated 55 miles north-northeast of Catbalogan. A disastrous volcanic eruption took place here in 1871. Pop., 1903, 9994.

CATARRH' (Fr. *catarrhe*, Lat. *catarrhus*, from Gk. *κατά, kata*, down + *ρῆν, rhein*, to flow). A symptom of great frequency in temperate latitudes, especially in changeable, moist climates, in the winter season. It consists of an increase in the secretion naturally flowing from the mucous membrane, preceded by a congestion and a brief period of dryness. Popularly a catarrh is called a cold, because exposure to cold lowers the vital resistance so that toxins of bacteria, entangled in the mucus, become active and attack the system. More often it follows overheating, the breathing of foul air, or checking of perspiration. Catarrh is much increased by constipation, a full diet, and lack of exercise. It may affect the nasal passages (rhinitis), the throat (pharyngitis), the vocal cords and neighboring parts (laryngitis), the membrane covering the eyeball and lining the eyelids (conjunctivitis), the stomach (gastritis), the bowels (enteritis), the urinary bladder (cystitis), the bronchi (bronchitis), and other tracts lined by mucous membrane. Each of these forms is described under its own title.

CATARRH, EPIZOÖTIC. See EPIZOÖTIC.

CATARRH, NASAL. See GLANDERS.

CAT'ASAU'QUA. A borough in Lehigh Co., Pa., 3 miles north of Allentown, on the Lehigh River, and on the Lehigh Valley, the Central of New Jersey, and the Philadelphia and Reading railroads (Map: Pennsylvania, L 6). Manufacturing is the principal industry, the establishments including blast furnaces, foundry and machine shops, silk mills, horseshoe, car wheels, rubber goods, and hardware factories, etc. Catasaqua was settled in 1805, and was chartered as a borough in 1853. It is governed by a burgess, elected every three years, and a unicameral council. Pop., 1910, 5250. Anthracite pig iron was first successfully made here in 1839.

CATAS'TROPHISM (Fr. *catastrophisme*, from *catastrophe*, Lat. *catastrophā*, Gk. *καταστροφή, katastrophē*, overthrow, from *κατά, kata*, down + *στροφή, strophē*, a turning, from *στρέφειν, strephein*, to turn). The doctrine that the vast changes which the earth has undergone from the beginning to the present time were caused by the sudden action of powerful physical agencies. This hypothesis was maintained by some of the earlier geologists to explain the physical features and structure of the earth's crust; the upheaval of mountains and the elevations and depression of land areas were considered to be catastrophic phenomena. Its advocates also claimed that the changes which have taken place in life forms cannot be explained fully by the theory of evolution and natural selection as taught by Darwin, Huxley, and others. The doctrine of catastrophism has met with strong opposition from leading scientists, and its application in geology is no longer recognized. One of the ablest opponents was Sir Charles Lyell, who made use of the forces and processes working at the present time to explain the geological history of the earth (uniformitarianism). Consult Lyell, *Principles of Geology* (London, 1875).

CATAUXI, ká-touks'ê. A naked reputedly cannibal tribe of Arawakan stock, living on the middle Purús River in western Brazil. They are said to be handsome and of somewhat light complexion. They cultivate manioc, make pottery, use the blowgun with poisoned arrows, and powder the roasted seeds of *Acacia niopp* for use as a narcotic stimulant.

CATAW'BA. An Eastern tribe of Siouan

stock, formerly holding a large district on the river of the same name in South and North Carolina. They were once the ruling tribe of South Carolina, numbering 1500 warriors, or perhaps 6000 souls, but by the inveterate hostility of the Tuscaroras and other Northern tribes, with intemperance and smallpox, they declined rapidly, and in 1743 were reduced to less than 400 men in spite of the fact that they had incorporated several smaller tribes. In nearly all the early wars, including the Revolution, they fought on the American side. About 100, of whom a few speak their ancient language, still reside on a small State reservation on Catawba River, in York Co., S. C.

CATAWBA, or **GREAT CATAWBA RIVER**. See **WATEREE RIVER**.

CATBALOGAN, kăt-bă'lô-găn'. The capital of the island Province of Samar, Philippines, situated at the mouth of the Antigas River on the west coast (Map: Philippine Islands, E 5). It lies 338 miles southeast of Manila, with which it carries on a considerable trade in hemp and coconut oil. Pop., 1903, 7758.

CATBIRD. In the United States, a common and familiar songster (*Dumetella*, or *Galeoscoptes carolinensis*), nearly related to the mocking bird. It is about 9 inches long, slate-gray in color, the crown and tail black. It is found in most of North America and is a general favorite. Although its call note resembles the mewing of a cat, its spring song is one of the most varied and brilliant heard in American woods; the bird is also a mimic. It feeds chiefly upon insects, nests in bushes, and lays four or five dark greenish-blue eggs. Although a migrant in the North, it breeds and also winters in the Southern States. It is usually to be found in gardens, along roadsides, and in bushy pastures. In Australia, the bower birds, especially *Ailurædus crassirostris*, are called catbirds because of their mewing notes.

CATBOAT (Icel. *kati*, small boat + *boat*). A small sailboat, usually not more than 30 feet in length, rigged with a large fore-and-aft mainsail only, set on a boom and gaff, and having the mast stepped as far forward as possible. Such a rig as this is called a *cat rig*. Catboats are very quick-working and are easily handled by one person, which quality has made them very popular. They usually draw but little water, depending on a centreboard to prevent their making leeway, and have great beam in proportion to their length.

CATCH (probably because the voices caught up the words in turn). A species of musical composition peculiar to England, without accompaniment and set to humorous words. The music is generally for three voices and in the canon (q.v.) style. As in the canon, each voice takes up the subject at a certain distance after the preceding has begun. One of the best specimens of a catch is by Calcott, on Hawkins's and Burney's histories of music, where the humor lies in one of the parts repeating "Burney's history"—sounding like "burn his history"—while the others are advocating Hawkins. In 1761 a Catch club was founded in London, which is still in existence. At various times prizes were offered for which the foremost English composers competed.

CATCH DRAINS, or **CATCH-WATER DRAINS**. Open drains constructed along a declivity to intercept and carry off surface water. The name is particularly applied to a drain which is built

to separate a district requiring artificial drainage from surrounding higher land, in order to keep the surface water from the higher land from running into it and so increasing the amount of water to be removed from the low land. In Holland this is accomplished by a dike and canal called "ungvart." See **DRAINAGE**.

CATCHFLY. The common English name of several plants of the family Caryophyllaceæ—which being clammy, in consequence of a peculiar exudation on the calyx and on the joints of the stem, often prove fatal to insects settling upon them. The most common American species of catchfly are *Silene virginica*, *Silene regia*, *Silene rotundifolia*, and *Silene antirrhina*. European species are *Silene armeria*, *Silene anglica*, and *Lychnis viscaria*. *Dionaea muscipula* is also sometimes called the Carolina catchfly, or Venus flytrap. See **CARNIVOROUS PLANTS**; **DIONÆA**; **LYCHNIS**; **SILENE**.

CATEAU, kăt'ô', LE. A town in the Department of the Nord, France, on the Selle, 14 miles east-southeast of Cambrai (Map: France, N., J 2). It manufactures shawls, merinos, silks, calicoes, and leather, has breweries and distilleries, and a considerable trade in iron, coal, and wine. Pop. (commune), 1901, 10,594; 1911, 10,212. The place derives its name from the château built by Herluin, Bishop of Cambrai, in the eleventh century. The Treaty of Cateau-Cambrésis (q.v.) between France, England, and Spain was signed here on April 3, 1559. Consult Miresse, *Le Cateau: ses origines, son abbaye* (Cambrai, 1905).

CATEAU-CAMBRÉSIS, **TREATY OF**. A treaty of peace concluded April 2-3, 1559, by Henry II of France with England and Spain. It confirmed the French in possession of Calais, which they had wrested from the English in 1558, after the latter had held it for more than 200 years. France surrendered her conquests in Savoy and Italy, but was allowed to retain the three bishoprics—Metz, Toul, and Verdun. The Treaty of Cateau-Cambrésis marks the definite abandonment on the part of France of the policy of Italian conquest initiated by Charles VIII in 1494.

CATECHETICAL (kăt'ê - kăt'i - kal) **SCHOOLS** (Fr. *catéchétique*, from Gk. *κατηχητικός*, *katēchētikos*, instructive, from *κατηχέω*, *katēchein*, to instruct orally, from *κατά*, *kata*, down + *ἔχειν*, *êchein*, to sound). The name given to the ancient Christian schools of theology, of which the chief were those of Antioch (160-400) and Alexandria (c.200-500). Clement (q.v.) and Origen (q.v.) were the most famous of the teachers in the latter; Theodore (q.v.) of Mopsuestia of the former.

CATECHISM (Fr. *catéchisme*, Lat. *catechismus*, from Gk. *κατηχησμός*, *katēchizēsmos*, to catechise, from *κατηχέω*, *katēchein*, to instruct orally, from *κατά*, *kata*, down + *ἔχειν*, *êchein*, to sound). A system of teaching by means of question and answer, employed for popular instruction in the truths and duties of the Christian religion. The composition of the first catechisms was, in all probability, suggested by the ordinary oral instruction of catechumens, and was intended for the help both of teachers and pupils. It appears to have been in the eighth and ninth centuries that the first regular catechisms were compiled, of which that by Kero, a monk of Saint-Gall, and that ascribed to Otfried of Weissenburg, are among the most noted. At later periods the use of catechisms prevailed chiefly among the op-

ponents of the hierarchy, as among the Waldenses, the Albigenes, the Wicliffites, and, above all, among the Bohemian Brethren. The term "catechism" appears to have been first employed in its present sense among the last-named. At an early period in the history of the Reformation the reformers began to avail themselves of this method of popular instruction, and their catechisms became important instruments in that great religious movement. In 1520 Luther published his first short catechism. In 1525 Justus Jonas and John Agricola were intrusted with the preparation of a catechism. In 1529 Luther published his larger and smaller catechisms, which found a place among the symbolical books or standards of the Lutheran churches. A number of catechisms were published also by the Swiss reformers and by those of England and other countries. The Geneva Catechisms, larger and smaller, were the work of Calvin. They were published in 1536, were speedily translated into various languages, and became acknowledged standards of the Reformed churches, not only in Switzerland, but in the Netherlands, in France, and in Hungary. The Church of Geneva has set aside the authority of these catechisms. The Zurich Catechism is received as a standard in the Church of Zurich. The Heidelberg or Palatinate Catechism is of greater importance, however, than any other as a standard of the German reformed churches. It was compiled by the Heidelberg theologians, Caspar Olevian and Zacharias Ursinus, at the request of the Elector Frederick III of the Palatinate; it was published in 1563, was approved by several synods, and was subjected to a revision by the Synod of Dort. In the Church of Rome the Tridentine Catechism is of high authority. It was prepared in accordance with the decrees of the Council of Trent, by Archbishops Leonardo Marino and Muzio Calini, Bishop Egidio Foscarini, and the Portuguese Dominican, Francesco Fureiro; revised by Cardinals Borromeo and Sirlet, and sanctioned by Pope Pius V. It was published in Rome in 1566. It is a manual of instruction for the clergy, to prepare them for their catechetical work. The catechism of the Orthodox Greek church was prepared by Peter Mogilas, Metropolitan in Kiev, and published in 1642. It received authority as a standard or symbolical book from a synod in Jerusalem in 1672. It is often called the Larger Russian Catechism, to distinguish it from the Smaller Catechism prepared by order of Peter the Great. Besides these catechisms, which have a historic interest, or are of importance from their symbolical character, there have appeared at all periods since the Reformation many others, both Protestant and Roman Catholic, some doctrinal, some controversial, some devoted to particular subjects, as the sacraments, or to particular purposes, as the preparation of candidates for admission to the Lord's Supper, some adapted to the mental capacity of very young children, etc.

The Catechism of the Church of England is published in the Book of Common Prayer. It is in two parts: the first contains and explains the baptismal covenant, the creed, the ten commandments, and the Lord's Prayer; the second explains the two sacraments, baptism, and the Lord's Supper. It is not known with absolute certainty who was the author of the first part; probably Thomas Cranmer and Nicholas Ridley had the principal hand in framing the questions and answers. It was originally put forth with

the 42 articles in the reign of Edward VI, and condemned as heretical in the reign of Mary. It must not be confounded with Cranmer's catechism, which was a larger work, differently arranged, and translated chiefly from the German catechism used in Nuremberg. This first part of the Church Catechism is spoken of as the *Shorter* Catechism. There was a *Larger* Church Catechism compiled also in the reign of Edward VI, by John Ponet, as is supposed, and it corresponds in some degree with the smaller work above described. It appeared in 1553, but was afterward revised and enlarged by Laurence Nowell, Dean of St. Paul's, and published in 1570; and though never officially promulgated by the Church, it has some authority from having been approved by the Lower House of Convocation. At the Hampton Court Conference (1604), at the beginning of the reign of James I, the *Shorter* Catechism was considered too short, and the larger one of Nowell's too long; and accordingly, at the King's suggestion, an addition was made to the former of that explanation of the two sacraments which now forms the second part of the Church Catechism. This was drawn up by Rev. Dr. John Overall. The rubrics in the Common Prayer Book enjoin the teaching of the Catechism in the church on Sundays and holy days after the second lesson at evening prayer; the 59th canon contains a like injunction, imposing penalties on the clergy who neglect this.

The Larger and the Shorter Catechisms, which, with the Westminster Confession of Faith, constitute the standards or symbolical books of the English-speaking Presbyterian churches, were compiled by the Assembly of Divines at Westminster; the *Shorter* Catechism "to be a directory for catechising such as are of weaker capacity"; the *Larger*, "for catechising such as have made some proficiency in the knowledge of the Christian religion." The *Shorter* Catechism was presented to the English House of Commons on Nov. 5, 1647; the *Larger* on April 14, 1648; and in July, 1648, both received the sanction of the General Assembly of the Church of Scotland, which, in the act of approving of the *Larger* Catechism, declared it to be "a rich treasure for increasing knowledge among the people of God," and that "they bless the Lord that so excellent a catechism has been prepared." The *Shorter* Catechism has, however, been far more generally used for the purpose of instruction than the *Larger*, which has been generally felt to be too minute in its statements and too burdensome to the memory to be employed as a catechism. The Westminster Catechisms differ from most in being more theological. Consult Schaff, *History of the Creeds of Christendom* (3 vols., New York, 1876-77).

CATECHU, kăt'ê-kū or -chū (Neo-Lat., from Kanarese, Malay *kāchu*, catechu). A substance of vegetable origin employed in tanning and dyeing, and medicinally as an astringent. In the East it is much used for chewing. The catechu of commerce is obtained chiefly from East Indian trees, such as the *Acacia catechu* and *Acacia suma*. It is known in India by the name Kutt; and catechu is said to be a name compounded of two words signifying 'the juice of a tree' (*cate*, a tree, and *chu*, juice). Cutch is another form of one or other of these two names, and is a common commercial name. Catechu is obtained from the heartwood of the trees by cutting it into small chips and boiling in water till the extract has the thickness of

tar. It is then allowed to harden for two days, so that it will not run, and is formed into balls about the size of oranges, which are placed on husks of rice or on leaves, and appear in commerce enveloped in them. The catechu manufacturers in northern India move to different parts of the country at different seasons, and erect temporary huts in the jungles, where they carry on their operations. *Pegu catechu* is the ordinary commercial variety and is used in medicine; it is soluble in hot water, in alcohol, acetic acid, and the strong alkalis; it is astringent and leaves a sweetish taste in the mouth. The active ingredients of catechu are catechuic acid or catechin, and a peculiar variety of tannic acid, of which it contains about 54 per cent. Catechu has been extensively employed in the dyeing of browns, fawns, drabs, and olives, and the development of logwood black on silks. It is much used for coloring stout canvas. See GAMBIR.

CATECHUMENS, *kāt'ē-kū'mēnz* (Fr. *catéchumène*, Lat. *catechumenus*, Gk. *κατηχούμενος*, *katēchoumenos*, from *κατὰ*, *katēchein*, to instruct orally). The appellation commonly given, in the early ages of the Christian Church, to those converts who had not yet received baptism, but were undergoing a course of training and instruction preparatory to it. They had a place assigned them in the congregation, but were not permitted to be present at the dispensation of the Lord's Supper. In the apostolic age converts appear to have been at once admitted to the sacraments; but afterward this ceased to be the case, and a period of probation was required. The catechumens were divided into different classes or grades, according to their proficiency. Those of the lower grade were not permitted to be present during the prayers of the congregation; and those only of the higher who had been declared fit to be baptized at the next administration of the ordinance were permitted to witness the dispensation of the Lord's Supper. The term "catechumens" was afterward employed to designate young members of the Christian Church who were receiving instruction to prepare them for confirmation or for the Lord's Supper, and is still often used in this sense.

CATEGORICAL IMPERATIVE. A term much used by Kant (q.v.) and his followers to designate what they consider to be the absolutely unconditional character of the demands that morality makes upon every reasonable being. If we wish to preserve health, we must observe the laws of hygiene, but we may not wish to preserve health. The obligation of hygienic rules is thus conditional upon a certain wish which may or may not be cherished. But whether we wish it or not, we ought to respect another man's property. This obligation is thus conceived to be absolute. See ETHICS.

CATEGORY (Fr. *catégorie*, Lat. *categoria*, from Gk. *κατηγορία*, *katēgoria*, category, charge, from *κατηγορεῖν*, *katēgoreuein*, to accuse, from *κατά*, *kata*, down + *ἀγορεύειν*, *agoreuein*, to declaim, from *ἀγορά*, *agora*, assembly, from *ἄγειν*, *agein*, to lead). A philosophical term in use since the time of Aristotle. Aristotle used it to denote the highest classes under which all predicates of propositions concerning things can be subsumed. He recognized 10 such categories, viz., substance, quantity, quality, relation, place, time, situation, possession, action, and passivity. The Hindu philosopher Kavāda is said to have treated categories in such a way as to have

attained a result very much like Aristotle's. (See Thomson's *Laws of Thought*, appendix by Max Müller.) The Stoics recognized four ontological categories—substance, attribute, states, and relations. Plotinus recognized five—being, rest, motion, identity, and difference. The Scholastics accepted Aristotle's classification without any other change than to Latinize the word "category" into *predicamentum*, whence comes our word *predicament* in the sense of 'plight.' To be in a bad predicament is to be so circumstanced that the predicate of a judgment that adequately expresses one's situation falls under a bad class of predicates. Kant (q.v.) objected to Aristotle's classification as being uncritical, and proposed a new classification resting on the classification of judgments in traditional logic. But Kant did more than give a new classification of categories. He introduced a new conception of their nature. They were for him a priori (q.v.) principles of synthesis, whereby thought brings into definite intelligible form the chaotic manifold elements of sense. Kant recognized four categories—those of quantity, quality, relation, and modality. Each of these was subdivided into three classes, with 12 resulting categories, viz., unity, plurality, totality; reality, negation, limitation; substance and accident, cause and effect, reciprocity; possibility and impossibility, existence and nonexistence, necessity and contingency. (See KANT.) Hegel criticized Kant for doing what Kant criticized Aristotle for doing, and insisted that dialectic is the only method whereby the categories can be satisfactorily determined. (See DIALECTIC.) He also modified the Kantian view of categories by making them not so much forms imposed by thought on sense contents, themselves devoid of such forms, but rather principles obtaining in the unitary world of thought and things. They have thus both an objective and a subjective significance. Hegel in this way embodied in his treatment of categories both the Aristotelian realism and the Kantian idealism. As a result of his dialectic method, Hegel obtained three groups of categories—being, essence, and concrete thought (*Begriff*). Each of these has many subdivisions, so that the list he gives includes considerably more than 100 categories; but he does not claim absolute accuracy or exhaustiveness for the detailed results he obtains. J. S. Mill proposed as substitute for Aristotle's classification: (1) feelings, or states of consciousness; (2) the minds which experience those feelings; (3) bodies or external objects which excite certain of those feelings; (4) the successions and co-existences, the likenesses and unlikenesses, between feelings or states of consciousness. For Mill, categories were classes of namable things. In recent times Ed. von Hartmann has written a detailed work on categories (*Kategorienlehre*, 1896). He defines a category as an unconscious a priori intellectual function of a definite sort. This is very much like Kant's view; but categories are for him not so much part of the innate constitution of each individual as they are the ways in which the impersonal reason acts in individuals. Thus in origin they are superpersonal, but as concrete functions they belong to the individualized group of functions. There are three great divisions—categories of sensation, of perception, and of thought. Each division is more or less subdivided. It will thus be seen that one's views of categories are

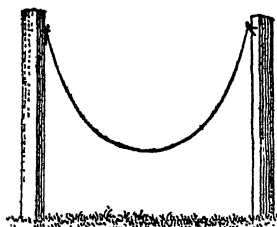
determined by one's philosophical views. Consult Caird, *Critical Philosophy of Immanuel Kant* (New York, 1889), and Harris, *Hegel's Logic* (Chicago, 1890).

CATEL, kâ'têl', CHARLES-SIMON (1773-1830). A French musician, born at L'Aigle. In 1787 he became accompanist of the Paris Ecole Royale de Chant (at which he had previously studied under Gossec), and upon its consolidation with the new Conservatory he was made professor of harmony. He later became an inspector of the Conservatory and in 1815 was elected to the Academy. Catel's most lasting work was his *Traité d'harmonie* (1802), an excellent textbook, and long a standard in France. Of his numerous compositions, only the operas *Sémiramis* (1802) and *Les Bayadères* (1810) are of any importance. Consult F. Hellouin and J. Picard, *Un musicien oublié, Catel* (Paris, 1911).

CATE'NA (Lat., chain). A commentary composed of extracts from different authors, elucidating a text, especially the text of the Bible. The composition of such commentaries dates from the fourth century. They became very common from the sixth century to the close of the Middle Ages. Prominent among the earliest compilers is Cassiodorus (c.480-580), and most famous is Thomas Aquinas (c.1226-74). Many extracts from otherwise unknown works have thus been preserved. Consult the English translation of the *Catena Aurea* on the Gospels by the latter (6 vols., new ed., Oxford, 1870). For a full list of catena, see Harnack, *Geschichte der altchristliche Litteratur* (Leipzig, 1897-1904).

CATENA, kâ-tâ'nâ, VINCENZO DI BLAGIO (c.1470-c.1531). A Venetian painter of the Renaissance. The place of his birth is not known, but he was a pupil of Giovanni Bellini, and his later works show the influence of Giorgione. To his early period belong "Madonna and Child" with landscape background (London); "Doge Leonardo Loredan Kneeling before the Madonna" (Ducal Palace, Venice), and "Holy Trinity" (San Simeone Grande, Venice); to a later period, "Knight Adoring the Christ Child" (National Gallery); "Christ Giving the Keys to Peter" (Gardner collection, Boston); "Count Raymond Fugger" (Berlin), and, finally, his masterpiece, "The Martyrdom of St. Christina" (1530, Santa Maria Mater Domini, Venice). Catena enjoyed the highest popularity among his contemporaries, who placed his works with those of Giorgione and Titian.

CATENARY (Lat. *catenarius*, from *catena*, a chain). The curve formed by a flexible, homogeneous, and inextensible cord hanging freely between two points of support and acted on by no other force than gravity. If the cord is not homogeneous and the density varies, the cord hangs in a curve different in shape from the



ordinary catenary; e.g., where the cord is such that the weight of any part of it is proportional to its horizontal projection, the curve is a parabola. The latter curve and the ordinary catenary are of importance in the theory of sus-

pension bridges. The catenary is represented algebraically by the equation:

$$y = \frac{c}{2} \left(e^{\frac{x}{c}} + e^{-\frac{x}{c}} \right)$$

It possesses several remarkable properties, one of which is that its centre of gravity is lower than that of any other curve of equal perimeter, and with the same fixed points for its extremities. The catenary seems first to have attracted the attention of Galileo, who attributed to it a parabolic form. Joachim Jungius (1669) showed the error of this supposition, but was unable to determine the equation of the curve, a result accomplished by Leibnitz (1691). The curve was also elaborately investigated by Jakob Bernoulli. The bibliography of the subject is given in Brocard, *Notes de bibliographie des courbes géométriques* (Bar-le-Duc, 1897). For a discussion of the mechanical properties of the curve, consult Price, *Analytical Mechanics*, vol. i (Oxford, 1868), and Minchin, *Treatise on Statics* (Oxford, 1880).

CATENIP'ORA (Neo-Lat. nom. pl., from Lat. *catena*, chain + *porus*, pore). A generic name given by Lamarck in 1816 to the chain coral, a peculiar tabulate coral found in a fossil state in the Silurian rocks, to which the name "Halysites" had already been applied by Fischer in 1806. For description, see HALYSITES.

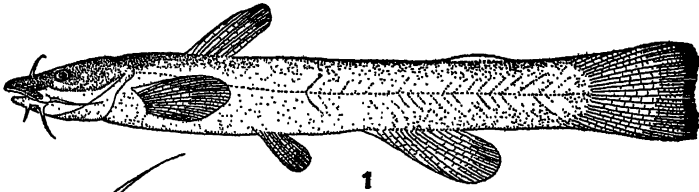
CATERPILLAR. See BUTTERFLIES AND MOTHS.

CATERPILLAR HUNTER. A predacious beetle of the family Carabidæ and genus *Calosoma*, of which several species prey upon caterpillars, earthworms, etc. To this genus belong a considerable number of species, of which a common one (*Calosoma scrutator*) is illustrated in the Colored Plate of INSECTS. See GROUND BEETLE.

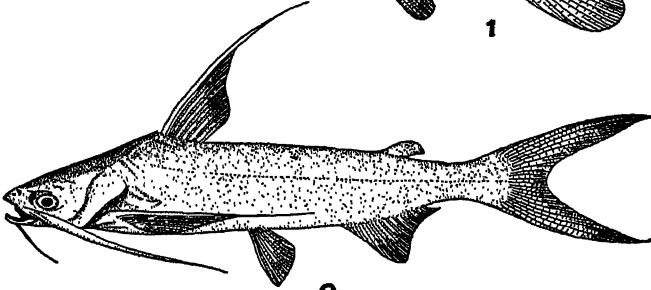
CATESBY, kâts'bi, MARK (c.1679-1749). An English naturalist, born probably in London. He visited North America and the Bahamas in 1712-19 and afterward published *Natural History of Carolina, Florida, and the Bahama Islands*, with colored figures drawn and etched by himself (1722-26). These were the first drawings of North American animals to be published. He also published *Hortus Britanno-Americanus* (1737) and *Migration of Birds* (1747).

CATFISH (so called from the purring sound when the fish is taken from the water). One of a group of physostomous (soft-rayed) fishes of both salt and fresh waters, comprising the order Nematognathi and the family Siluridæ and its allies. "The fishes of this order," writes Dr. D. S. Jordan, "agree in having the maxillary bone imperfectly developed, and forming the basis of a long fleshy feeler or barbel [and in] . . . the presence, in most cases, of additional pairs of barbels about the mouth, near the tip of the upper or the lower jaw, or both; the absence of scales and the presence in many species, especially those found in tropical waters, of bony plates. These sometimes form a more or less perfect coat of mail on the sides of the body; at other times they form a shield on the top and back of the head. Another feature is the development, in most cases, of the first ray in the dorsal and pectoral fins as a strong, stiff, sharp, serrated spine which forms an effective weapon of defense. The spines of the pectoral fins are strongest, and they are usually 'set'—i.e., firmly erected—whenever the fish is caught

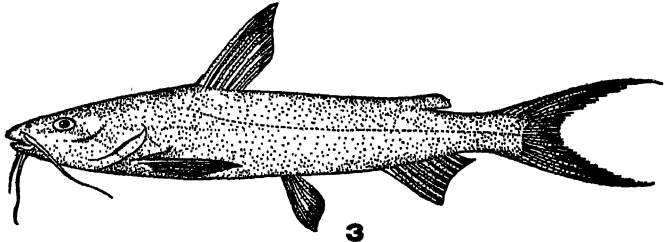
CATFISH



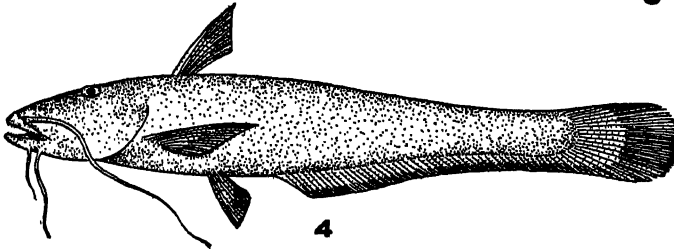
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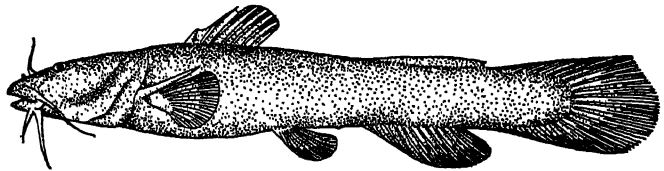
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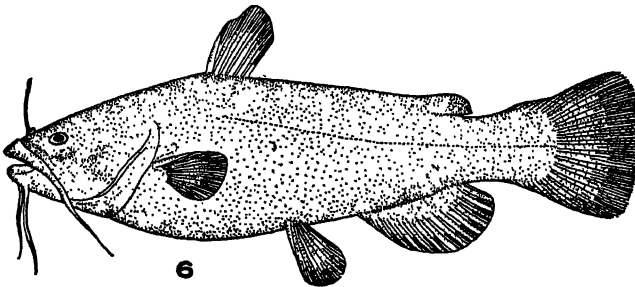
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1. MAD TOM (*Schilbeoides miurus*).
2. GAFF-TOPSAIL CATFISH (*Felichthys felis*).
3. SEA CATFISH (*Galeichthys felis*).

4. EUROPEAN CATFISH OR WELS (*Silurus glanis*).
5. STONE CATFISH (*Noturus flavus*).
6. BLACK BULLHEAD (*Ameiurus melas*).

or attacked. These spines are a source of much annoyance to fishermen, and there are few persons . . . in the Eastern States who have not had some painful experience with the 'horns' of a catfish." The wounds made by these spines often heal with difficulty, owing to the jagged nature of the cut and to the slime introduced; in one genus (*Noturus*), moreover, a poison gland is connected with the pectoral spine. They use the spine in ugly fights among themselves. The catfishes inhabit the fresh waters and shallow coastal waters of the warmer parts of America, Africa, and the Orient, but are represented by only a single European species, the typical silurus of the Latins, and the sheatfish of English writers. (See SHEATFISH.) They vary from 2 inches to a dozen feet or more in length, and may exceed 200 pounds in weight. Most of them are good food and everywhere enter into the diet of the people. In habits they are comparatively sluggish, remain close to the bottom, and are carnivorous and voracious, eating eggs and fry of aquatic animals, and seizing such fishes, amphibians, and birds as they can overcome. Few are swift swimmers, but they lurk in wait for prey, being almost invisible by reason of their dull, dark colors, and making a quick rush; consequently the larger ones are among the most destructive enemies of aquatic life.

The North American catfishes have the skin wholly naked and are familiarly represented by the horned pout. (See BULLHEAD.) The same genus (*Amiurus*) contains several other species often termed mud cats. The stone cats belong to the genus *Noturus*, are small, comparatively slender, dark-hued, and inflict poisoned wounds. Another genus, the channel cats (*Ictalurus*), dwell in running streams and lakes and include many large forms, the fork-tailed catfish of the Great Lakes (*Ictalurus lacustris*) sometimes weighing 100 pounds; while the "white" channel cat (*Ictalurus ponderosus*, or *punctatus*) of the Mississippi River valley may grow to 150 pounds, and become the largest of our freshwater fishes except the California sturgeon. An illustrated monograph of the fresh-water species, by Dr. D. S. Jordan, will be found in *Bulletin No. 10* (1877) of the United States National Museum at Washington. The sea catfish are closely allied to the channel cats, and two species are common along the Atlantic coast, both 2 to 5 feet long, and blue above the silvery bellies; but more than 100 species of this marine group, which haunt sandy bottoms near shore and furnish poor food, are scattered through the tropics, especially in the East Indies.

The South American fresh waters abound in catfishes of the genus *Pimelodus* and its allies, the largest species of which is the leopard cat, or suravi (*Pimelodus frati*), from rivers of Argentina and Uruguay, which is 6 to 7 feet long, and yellow, spotted with black. Another characteristic South American group is that of the mailed cats, of the genus *Callichthys*, in which the body is almost entirely covered by four rows of large, hard, narrow, scaly plates, two rows on each side, and the head is well covered with bony plates. They are said to be able to make their way over land from a pool which may be drying up to another some distance away; sometimes they bury themselves in the mud of wet meadows. They build their nests near the margin of the water, at the beginning of the rainy season, both sexes guarding them

until the eggs are hatched. The genera *Doras*, *Loricaria*, and *Arges* are allied groups of many species. Africa abounds in fishes of this family, of which the best known is the bayad (q.v.) of the Nile. A different Nile catfish (*Malapterurus electricus*) has the power of delivering an effective electric shock. (See ELECTRIC FISHES.) Many other species, some of large size, having the general characteristics outlined above, haunt the sluggish rivers and estuaries of India, Siam, China, and the larger islands thence to Australia, with varying importance as food. Among these is notable the eel-like genus *Clarias*, "eelpouts," about 30 species of which are known, some reaching 6 feet in length. The catfishes are known as fossils well back into the Tertiary.

The name applied to various fishes of other families; as, in England, to the wolf fish (*Anarrhichas lupus*), the cusk, and one or more small sharks. In Australasia the stargazers (*Kathostoma*) are called catfish, and elsewhere the chimeras are called "sea cats."

CATGUT (probably a corruption, by popular confusion with *kit*, cat, of *kit*, fiddle, apparently from AS. *cytere*, from Lat. *cithara*, Gk. *κithara*, *kithara*, guitar, and *gut*, Ger. *Gotte*, gutter, from AS. *géotan*, Goth. *giutan*, Ger. *geissen*, Lat. *fundere*, Gk. *χεῖν*, *chein*, to pour). A substance employed in the manufacture of the strings of violins, harps, guitars, and other musical instruments, and also used for the cords carrying clock weights, in the bows of archers, and for whip cord. It is generally prepared from the intestines of sheep, rarely from those of the horse, ass, or mule, but never from those of the cat. The first stage in the operation is the thorough cleansing of the intestines from adherent feculent and fatty matters, after which they are steeped in water for several days, so as to loosen the external membrane, which can then be removed by scraping with a blunt knife. The material which is thus scraped off is employed for the cords of battledores and rackets, and also as thread in sewing the ends of intestines together. The scraped intestines are then steeped in water and scraped again, treated with a dilute solution of alkali (4 oz. potash, 4 oz. carbonate of potash, and 3 to 4 gallons of water, with occasionally a little alum), drawn through a perforated brass thimble, and assorted into their respective sizes. In order to destroy any adherent animal matter, which would lead to putrefaction and the consequent development of offensive odors, it is customary to subject the catgut to the fumes of burning sulphur (sulphuric acid). The best strings are used for musical instruments, and those which come from Italy and are known as *Roman strings* are the strongest. They are remarkable for their clearness and transparency. The surgeon also uses the best grades of catgut in closing wounds. Cords for suspending clock weights are made up of catgut split longitudinally into several lengths. Whipcord is made from catgut which has been twisted in a manner somewhat similar to single-corded ropes.

CATH'ARI, or CATHARISTS (ML., from Gk. *καθαρός*, *katharos*, pure). A name very generally given to various sects which appeared in the Church during the Middle Ages. It appears to have been sometimes assumed in profession of a purity of doctrine and morals superior to that which generally prevailed in the Church, sometimes bestowed ironically in ridi-

cule of such a profession. It was used as a designation of the Novatians (q.v.) of the third century, the Paulicians (q.v.) of the seventh and succeeding centuries; but more usually of sects which appeared in Lombardy in the beginning of the eleventh century, and afterward in France and the west of Germany, and of the Bogomiles of the twelfth century. In the eleventh century the Patarenes appeared in Milan and were called Cathari. The names "Albigenses" and "Cathari" are often used as equivalent to one another; in fact, it is almost impossible to differentiate the various bodies known by different names and all called Cathari. Manichæism, Gnosticism, and Montanism are ascribed to the Cathari; but as their doctrines were a confused agglomeration of different doctrines, and consequently the descriptions of contemporary writers are not always concordant, it is difficult to make out their system in detail. It appears quite certain that the Cathari differed among themselves in their doctrines, and in the degree of their opposition to the dominant Church. Some of them advocated and practiced a rigid asceticism. There is no good evidence that any of them nearly approached to the doctrines of the Reformation, although in their rejection of tradition, of the authority of Rome, of the worship of saints and images, etc., there are notable points of agreement with the views of the reformers. Consult: C. Schmidt, *La secte des Cathares* (Strassburg, 1849); J. J. Döllinger, *Sekten-geschichte*, vol. ii (Munich, 1890); also H. C. Lea, *History of the Inquisition* (3 vols., New York, 1888); and Molinier, "L'Eglise et la société Cathares," in *Revue Historique*, vols. xciv and xcvi (Paris, 1907).

CATHARINE (Fr. *Catherine*, Lat. *Catharina*, Gk. *Katharion*, *Katharinē* from *katharōs*, *katharos*, pure). The name of six saints of the Roman Catholic church. The simple designation of *St. Catherine*, however, is often given to **CATHARINE OF ALEXANDRIA**, said to have been of royal descent, who, publicly confessing Christianity at a sacrificial feast appointed by the Emperor Maximinus, was put to death in 307 A.D., after being tortured on a wheel. Hence the name of "St. Catherine's wheel." She is regarded as the patroness of girls' schools. Her day is November 25 or March 5. (See her life in the publications of the Early English Text Society; also in those of the Roxburghe Club, both London, 1884.)

SAINT CATHARINE OF SIENA, daughter of Jacomo Benincasa, a dyer of Siena, was born there in 1347; practiced extraordinary mortifications, and was said to have been favored with especial tokens of favor by Christ, whose wounds were impressed upon her body. (See **STIGMATIZATION**.) She became a Dominican, and died in Rome, April 29, 1380. She wrote devotional pieces, letters, and poems; the best edition appeared in Siena and Lucca, in 1707-54 (in 5 vols., 4to), under the title of *Opere della serafica Santa Catarina*. Her letters were published in French (Paris, 1854; best in the original, 4 vols., Florence, 1860). In English have appeared *Saint Catherine of Siena as Seen in her Letters* (London, 1905); *Dialogues of the Seraphic Virgin Catherine of Siena* (London, 1896); the dialogue *De Perfectione* is translated in Miss Drane's biography mentioned below. Consult her life by J. E. Butler (4th ed., London, 1895); Augusta I. Drane (London, 1880); Scudder (New York,

1905); Gardner (New York, 1908); Roberts (New York, 1906).

SAINT CATHARINE OF GENOA was born in 1447 of the distinguished Genoese family Fieschi. Her father was Viceroy of Naples under René of Anjou. She was very beautiful. Her own wish was to become a nun, but her parents gave her in marriage to a Genoese nobleman, Giuliano Adorno (Jan. 13, 1463), in order to heal the breach which had come between the two families. Her married life was unhappy, and she suffered much not only from her husband's personal treatment, but from his extravagance and licentiousness. At last bankruptcy overtook him and they were reduced to poverty. Then her spiritual nature showed itself. She started on a career of philanthropy as nurse (1479) and from 1491 to 1497 was chief nurse in a great hospital. Her husband was converted through her influence, entered the third order of St. Francis, and joined her in charitable labors. Her ascetic piety was extraordinary. It is said that from 1478 to 1500 she fasted all Advent and all Lent, and took no nourishment of any kind, but drank water mingled with vinegar and salt. She died Sept. 15, 1510, having won so high a reputation for piety that Pope Clement XII canonized her in 1737; and Benedict XIV put her in the Martyrology under March 22; but in the *Acta Sanctorum* she is found under September 5. She had many ardent disciples, and one of them wrote from her lips, in Italian, the *Treatise on Purgatory* (Eng. trans., London, 1878). Her life, written by T. de Bussiere, prefaced a French translation of her works (Paris, 1860). See also her life by Fliche (Eng. trans., New York, 1874), and Von Hugel, *The Mystical Element in Religion* (New York, 1909).

SAINT CATHARINE OF BOLOGNA and **SAINT CATHARINE OF SWEDEN** (1331-81), the fourth daughter of St. Birgitta (or Bridget) of Sweden, are of less note.

CATHARINE I (?-1727). Mistress and wife of Peter the Great, and Empress of Russia from 1725 to 1727. She was born between 1682 and 1685, the daughter of a Lithuanian peasant, Samuel Skavronski, or perhaps of a Baltic nobleman, Colonel Rosen. Her mother was undoubtedly a serf. She was brought up as a foundling by the pastor Glück, at Ringen and Marienburg, in Livonia, and was married to a dragoon, who was immediately ordered into active service. At the taking of Marienburg by the Russians, in 1702, Glück threw himself and his family on the mercy of the Russian commander, Sheremetieff, who was attracted by the beautiful face of the young peasant girl and kept her with him when the other captives were forwarded to Moscow. A few months later Menshikoff, the favorite of Peter, saw her, and took advantage of his rank and power to deprive Sheremetieff of his prize, only to be in turn despoiled by Peter himself. With a figure and bearing that bore testimony to her ignoble birth, she seems nevertheless to have had in her face a peculiar charm, and, unlettered though she was, she possessed an active and practical mind that appealed to Peter. She became his most influential adviser and confidant, exercising over this man of iron will and violent passions an influence such as no other person had. Peter profited by her resourceful intellect in the campaign against the Turks in 1711, and the colored accounts that have come down to us represent her as having saved the Czar and his army when they were hemmed

of the Wars of the Roses. There are a number of indications that Henry was troubled by these thoughts long before the advent of Anne Boleyn (q.v.), but, at any rate, her appearance and the resultant passion it aroused in Henry brought them to the surface. From 1527 or perhaps earlier Henry worked to secure a decree of nullity as to his marriage with Catharine and a marriage with Anne that would bring him a son to secure the succession. He professed doubts as to the validity of his marriage, and in 1527 a collusive suit was secretly brought before Wolsey. Nothing came of this; but the question of divorce was openly raised. Pope Clement VII refused to declare the marriage void at Henry's request through the secretary, Knight, whom the King had sent to Rome for that purpose. He, however, granted a commission to Campeggio and Wolsey to inquire into the validity of the marriage; but before these prelates Queen Catharine refused to plead, and appealed to the Pope. The King craved judgment. The legates cited the Queen, and, declaring her contumacious when she did not appear, went on with the cause; but Cardinal Campeggio, anxious only to stay the proceedings when the King expected a decree, prorogued the court until a future day. The King consulted the universities of Europe, many of which declared the marriage invalid. The Pope now summoned the King to Rome, but Henry haughtily refused to appear either in person or by deputy, for he maintained that such obedience would be to sacrifice the prerogatives of his crown, and, setting the Pope at defiance, he married Anne Boleyn, Jan. 25, 1533. On the 23d of the following May Cranmer declared the first marriage void, and on March 23, 1534, Pope Clement pronounced it valid, thus bringing about the alienation of Henry VIII from the Roman see. Queen Catharine did not quit the kingdom, but was closely guarded at Ampthill, in Bedfordshire, afterward at Buckden, and then at Kimbolton Castle, Huntingdonshire, until her death on Jan. 8, 1536. In the meantime, although absolutely friendless and harassed by ceaseless persecution, she displayed heroic courage and surprising mental powers, defeating every base design of the King and his agents to induce her to sign away the rights of herself and her daughter Mary. Catharine was educated under her mother's direction and was a fair Latin scholar. Her character was unimpeachable, and her disposition sweet and gentle. Consult: *The Calendars of State Papers for the reign*, edited by Brewer and Gairdner (1880-90), and the Spanish series, edited by Bergenroth and Gayango, vol. ii (1868); Brewer and Gairdner, *Letters and Papers of the Reign of Henry VIII* (London, 1862); Hall, *Chronicle* (London, 1809); Pocock, *History of the Reformation* (new ed., London, 1873); *The Divorce, 1527-33* (2 vols., Oxford, 1870); Le Grand, *History of the Divorce of Henry VIII and Catharine*, with Burnet's answer (London, 1690); Nicholas Harpsfield, *Treatise on the Pretended Divorce*, ed. by Pocock (London, 1878); Froude, *The Divorce* (New York, 1891); Froude, *History of England*, vols. i-ii (New York, 1871); Cavedish, *Life of Cardinal Wolsey* (2d ed., London, 1827); Dixon, *Two Queens* (London, 1873-74); Lingard, *History of England*, vol. vi (Boston, 1853-55); and Brewer, *Reign of Henry VIII*, ed. by Gairdner (2 vols., London, 1884); Pollard, *Henry VIII* (London, 1905). An excellent bibliography of the divorce controversy is pro-

vided by Huth, *Marriage of Near Kin* (2d ed., London and New York, 1887).

CATHARINE OF BRAGANZA, brá-gân'zá (1638-1705). Queen of Charles II of England. She was the daughter of John IV, Duke of Braganza and King of Portugal. Her mother, Luísa de Guzmán, a daughter of the Duke of Medina Sidonia, was a woman of ability, who governed Portugal for several years after the death of her husband and who foresaw the Restoration in England and proposed the marriage of Catharine with Charles to gain an ally against Spain. That power tried to prevent the marriage; Portugal gave a dowry of £300,000 and the towns of Tangier and Bombay, besides many privileges of trade. After the marriage at Portsmouth, in May, 1662, Charles was pleased with the innocence and sweet disposition of his bride, who had been carefully trained in a convent. But he soon introduced mistresses into the court and, when the Queen expressed indignation, lectured her upon the duty of submission. After repeated humiliations of this kind, she passively acquiesced, and Charles, fickle as he was, showed her a certain attention and affection for which she was grateful. He shielded her from the calumny and plots of anti-Romish agitators, who charged her with a design to poison the King and propagate the Catholic faith in England. She truly mourned his death. After a life of seclusion during the reign of James II and the first years of William III, she returned to Portugal in 1692, and acted as regent to her brother, Dom Pedro, until her sudden death, Dec. 31, 1705. Consult: Strickland, *Lives of the Queens*, vol. iv (London, 1888); Jesse, *Memoirs of the Court of England*, vol. iii (London, 1870); Ranke, *History of England, Principally in the Seventeenth Century* (Oxford, 1875); Davidson, *Catherine of Bragança* (London and New York, 1908).

CATHARINE OF VALOIS, vá'lwá', or OF FRANCE (1401-37). Queen of Henry V of England. She was the daughter of Charles VI. When she was 12 years old, Henry proposed to marry her and demanded as a dowry 2,000,000 crowns and the provinces ceded by the Treaty of Bretigny, together with Normandy. The proposition was rejected, but Henry soon afterward invaded France (1415) and forced a compliance with his terms. When he married Catharine at Troyes, June 2, 1420, he received immediate possession of the provinces claimed, the regency of France during the life of his father-in-law, and the reversion of the sovereignty after the death of Charles. On Feb. 24, 1421, Catharine was crowned at Westminster, and on December 2 of that year she became the mother of Henry VI. The next year she was in France, where her husband died, and she returned to London with his body. After the funeral little is heard of her history, the only notable event being her secret marriage to Owen Tudor, a poor Welsh gentleman in attendance on her son. The marriage was not openly proven until 1436. By Tudor she had four children, one of whom was made Earl of Richmond, and married Margaret Beaufort, heiress of the House of Somerset, and junior representative of the branch of John of Gaunt. Margaret became the mother of Henry VII. Consult Miss Strickland, *Lives of the Queens of England*, vol. iii (London, 1840).

CATHARINE PARR. See PARR, CATHARINE.

CATHARINE WHEEL (from the image of St. Catharine represented as being martyred

on the wheel). An heraldic device which is frequently used as a charge in coats of arms, when it is represented with teeth.

CATHARISTS. See CATHARI.

CATHARTIC (Fr. *cathartique*, from Gk. *kathartikos*, *kathartikos*, purgative, from *katharos*, *katharos*, clean). A name originally applied to any medicine that was supposed to purify the system from "disease material" (*materies morbi*), which was generally presumed by the ancients to exist in all cases of fever and acute disease (see CRISIS), and to require to be separated or thrown off by the different excretions of the body. Ultimately the term "cathartic" became limited in its signification to remedies capable of causing copious evacuation of the bowels and having a more pronounced effect than the "laxatives." The principal cathartics are aloes, colocynth, rhubarb, jalap, senna, Epsom and other salts, castor oil, croton oil, and elaterium. They are employed when it is desirable to terminate an attack of constipation, or to cause large, watery evacuations for the purpose of abstracting water from the blood, so that water in the pleural or abdominal cavities or in the cellular tissues may pass into the blood vessels and thereby reduce a dropsical condition. Cathartics act as irritants on the alimentary canal, provoking increased secretion to expel them, or as stimulants of the peristaltic action of the muscular coat of the intestine through reflex nervous disturbance. See the drugs mentioned, under their names. See also CONSTIPATION; PURGATIVES.

CATHARTIDÆ. See CONDOB.

CATHAY, *kāth-ā'*. A term which came into use in later mediæval times and was applied to the vaguely wondrous regions of the Far East. It was given to China by the first European explorer in that land, Marco Polo (q.v.). It is supposed to have been derived by him from the name of a race of mediæval conquerors of northern China, *Khitah* or *Khitai*, who had almost disappeared at the time of his visit, and who may have been conceived by him as having formed the original substratum of the Chinese people. It is an interesting fact that the name of this conquering tribe, which has long since disappeared in the place of its origin and mediæval use, is preserved in the modern Russian name for China, i.e., *Khitai*. Columbus reasoned that, since the earth is spherical and not flat, he could reach Cathay by sailing westward.

CATHCART, SIR GEORGE (1794-1854). A British general, son of William, Earl Cathcart. Educated at Eton and Edinburgh, he joined the army in 1810; fought in the campaigns of 1812-13; served as aid-de-camp to the Duke of Wellington at Quatre Bras and Waterloo; and in 1852-53, as Governor of the Cape of Good Hope, granted the first constitution to the colony, ended the Kaffir War, and crushed the Basutos. He distinguished himself by his bravery in the Crimean War and fell at Inkermann on Nov. 5, 1854. He was buried at Cathcart's Hill, which was named after him. He was the author of *Commentaries on the War in Russia and Germany in 1812 and 1813* (London, 1850).

CATHCART, SIR WILLIAM SCHAW (1755-1843). First Viscount and Earl Cathcart of the United Kingdom (1814); previously tenth Baron Cathcart of Scotland (1807). A British general and diplomatist, son of Baron Cathcart of Cathcart, Renfrew. He was born Sept. 17, 1755. Educated at Petersham, he studied law at Dresden

and Glasgow, was admitted advocate, but at his father's death entered the army, took a prominent part in the American war, and fought with distinction in Flanders and Germany. In 1801 he was made lieutenant general and in 1803 commander in chief for Ireland and later for Scotland. In July, 1807, he commanded the land forces coöperating with the fleet in the British attack on Copenhagen. For his services he was raised to the peerage, with the title of Viscount, and received the thanks of Parliament. In 1813 he was Ambassador to St. Petersburg, accompanied the Czar Alexander in the campaigns of 1813 and 1814, and was present at the Congress of Vienna. He then returned to St. Petersburg, where he remained as Ambassador until 1820. In 1821 he retired from public life, and died June 16, 1843.

CATHCART, WILLIAM (1825-1908). An American Baptist clergyman. He was born at Londonderry, Ireland, and was educated at the University of Glasgow and at Horton (now Rawdon) College, Yorkshire, England. He came to the United States in 1853, held a pastorate in Philadelphia, and was elected president of the American Baptist Historical Society. His publications include the following: *The Baptists and the American Revolution*; *The Papal System*; *The Baptist Encyclopædia*, his most important work; *The Baptism of the Ages and of the Nations*.

CATHE'DRAL (from Gk. *kathēdra*, *kathedra*, a seat). This word was used of the actual throne of the bishop in the apse of his church. Hence the episcopal church was called a cathedral church, *ecclesia cathedralis*; the residence of the bishop was a cathedral city, and a formal decision of the bishop was an *ex-cathedra* utterance. There could be but a single such church or city in the bishop's province. This was called originally a *parish*, but soon a *diocese*, corresponding exactly to the late Roman civil diocese or province. All churches within his diocese were consecrated by the bishop, and all except his one episcopal church were called parish churches. The extent to which the monastic churches came under the jurisdiction of the bishop varied greatly in different countries and at different times. The term used for the capital church of the diocese was in early times *ecclesia mater*, or *matria*, and the term *ecclesia cathedralis* came later, and cathedral was first used as a substantive only in the tenth century and then only in the West, for in the East neither the name nor the power it represented ever existed. How the special body of cathedral clergy was formed by a gradual process from the diocesan clergy is a matter foreign to this article. But the prominence of cathedral churches at different times corresponds largely to the religious and political power of the episcopacy. Thus, cathedral churches were important in the fourth and fifth centuries, when such men as Augustine, Ambrose, Cyril, and John Chrysostom were bishops and ruled the Christian world. But when monasticism, under the followers of Benedict and Basil, was overwhelmingly ascendant, as it was from the seventh to the eleventh century in both East and West, monks occupied the cathedral thrones and filled the ranks of the canons, episcopal churches could not vie with those of the great monasteries, and the people, the government, and the papacy looked to abbots and not to bishops. Then arose that hybrid class of monastic cathedrals,

especially in countries converted by monks, such as England and Germany in Saxon and Carolingian times. It was when the great communal movement came in the eleventh and twelfth centuries that three new social powers arose—centralized government, communal autonomy, episcopal independence. In the social struggle the kings and emperors usually sided with the free communes and their bishops—especially in France and Germany. The cathedral churches became for the cities the badge of civic autonomy, the centre of civil as well as of religious life, the outward sign of prosperity. The Rhenish cities—Speyer, Worms, and Mainz—were among the first; then the Hanseatic towns and the Saxon, Lübeck, Hanover, and Hildesheim, all in the tenth and eleventh centuries. They felt that great movement under the Otthos and Henrys. Next came, in the eleventh and twelfth centuries, the great Italian communes—Pisa, Milan, Parma, Cremona, Bologna, and others in the north; with even southern cities, such as Benevento, Bari, Trani, Amalfi. Then the communal movement reached France in the middle of the twelfth century, and it bloomed with the rise of Gothic art at Sens, Senlis, Noyon, Laon, Paris, and Chartres. The lawlessness and arrogance of the wealthy monasteries and of the great abbots, who as feudal lords claimed practical independence both of kings and bishops, and sided with the feudal barons in the struggle for social, political, and religious supremacy, contributed to the union of the resources of king, bishops, and people in the building of these great cathedrals. In the thirteenth century the episcopal power and importance of the cathedral reached their zenith, and the important monuments then built throughout Europe are too many to enumerate (see the paragraph on *Gothic* under ARCHITECTURE, and *GOthic ARCHITECTURE*). New and more sumptuous churches replaced the smaller edifices of an earlier age, under the religious enthusiasm born of the Crusades, which led the entire people to give their work freely. A cathedral was usually erected by means of voluntary contributions solicited from all classes—rich and poor—not only throughout the diocese, but beyond. Previously the trend of munificence had been almost entirely directed towards the monastic orders. (See *BENEDICTINES*; *MONASTERY*.) But enthusiasm was now much more general for the erection of the cathedrals that were truly representative of the whole people. Contemporary chronicles are full of the way the people of both sexes and all ages brought and handled the stone, the timber, and other materials. When completed, the cathedral served (except in England) also as town hall for political meetings, as hall for the *mysteries*, which were the theatrical performances of the Middle Ages, its square for the periodical fairs. It usually crowned the city, rising far above its roofs in a central and prominent position. In England, with no large cities and with an almost wholly agricultural population, many of the great monastic churches were at the same time cathedrals, the abbot being also the bishop of the diocese, so that there was no conflict of rival jurisdictions. These were the “regular” cathedrals, served by “regular” or monastic bishops, deans, and canons (Canterbury, Durham, Winchester, etc.). The others were “secular” cathedrals, as Salisbury and Wells. Among the most important cathedrals, architecturally speaking, are the following:

ITALY. Bari, Como, Ferrara, Florence, Lucca, Milan, Modena, Monreale, Orvieto, Palermo, Piacenza, Pisa, Siena.

GERMANY. Bonn, Cologne, Freiburg, Mainz, Ratisbon, Speyer, Strassburg, Worms.

SWITZERLAND. Basel, Zürich.

AUSTRIA-HUNGARY. Vienna.

FRANCE. Albi, Amiens, Auxerre, Beauvais, Bourges, Chartres, Laon, Le Puy, Lyons, Noyon, Orleans, Paris, Poitiers, Rouen, Rheims, Senlis, Sens, Tours, Troyes.

ENGLAND. Canterbury, Durham, Exeter, Ely, Lichfield, Lincoln, St. Paul's, Salisbury, Southwell, Wells, Winchester, Worcester.

SPAIN. Ávila, Barcelona, Burgos, Granada, Jaén, León, Salamanca, Seville, Tarragona, Toledo.

BELGIUM. Antwerp, Brussels, Ghent, Louvain, Malines, Tournai, Ypres.

See PLATES OF AMIENS, CANTERBURY, COLOGNE, DURHAM, FLORENCE, GLOUCESTER, LINCOLN, LYONS, MEXICO, MILAN, MOSCOW, PISA, ST. PAUL'S (London), ST. PETER'S (Rome), STRASSBURG, WINCHESTER, and YORK.

It cannot be said that there was any special style or special form of plan used for cathedrals as distinct from other churches. The large body of canons connected with a cathedral made a large choir natural, and so the development of this part of the church (see *CHURCH*) in the monastic churches of the preceding age was adopted by the cathedral builders of the twelfth and succeeding centuries. The greater size and immense resources available made, however, the cathedrals the touchstones of artistic conditions; but the cathedral is not always the largest or finest church even in the cathedral town, as in Bologna (q.v.), where the cathedral is far inferior to the great parish church of San Petronio. It is a misnomer to apply the term “cathedral” to the basilica of St. Peter at Rome or of St. Mark at Venice. The minster at Ulm is not a cathedral, though commonly so miscalled. In France, where scholastic philosophy was seeking to synthesize life and knowledge, the cathedral was made the vehicle for the expression in material forms of its encyclopædic learning for the edification of the masses. The Church had always sought to make of art a great educational engine, and the effort, previously scattered in basilicas and churches of all kinds, was now more concentrated in the cathedrals.

In Italy the cathedral, the tower, and the baptistery frequently formed a group of three in the great square, and to them was often added the episcopal palace. Sometimes, especially in France and England, various dependent buildings, such as cloister, chapter house, and refectory, were attached to the cathedral after the monastic fashion, but usually it stood clear, on the most conspicuous site of the city. In England the entire group, with usually an extensive open space in front planted with trees, was inclosed within a high wall with several gates, whence the name *close*. Wells is the most complete example of such a group; it is a secular cathedral, but in every respect reproduces the grouping of a monastic cathedral. This arrangement is not found on the Continent, where the cathedral was the centre of the civic life. Rome occupied a unique position. St. John Lateran was more than the cathedral of Rome; it was the mother of all churches, being the seat of the Pope, but it was not called cathedral. St. Peter succeeded it in

the fifteenth century. The other great basilicas of Rome—St. Paul Without the Walls, Santa Maria Maggiore, Santa Croce in Gerusalemme—also had a rank superior to that of the ordinary cathedral.

Organization. The bishop in his church was surrounded by his college of presbyters, who served him as counselors, assistants, and missionaries. This college or chapter, in England sometimes consisted of "secular or non-monastic clergy," and sometimes of "regulars," who were under monastic rule and lived in buildings common to all. Of both kinds of chapters the bishop was the head—of the latter, as the abbot of the monastery to which his cathedral church belonged; and of the former, as having sole authority over it. In early times there was an archpresbyter, who had chief authority among the cathedral clergy, always in strict subordination to the bishop. He was gradually supplanted by the archdeacon, who was followed in the eighth and ninth centuries by the "præpositus" or provost. The "dean," the present head of all English cathedral chapters, first appears in the tenth or eleventh century. Often, if the bishop's diocesan duties increased and important political functions also were assigned him, he was obliged to leave the affairs of his cathedral to the head of the chapter. This is the explanation of the strange anomaly, sometimes witnessed in modern times, that in his own cathedral church the bishop has less authority than in any other church of his diocese. Under the bishop as its nominal head, the chapter of a fully organized cathedral, formed of secular priests, consisted of four chief dignitaries and a body of canons. I. The four high officers were: (1) the "dean," as the general head of the chapter charged with its internal discipline; (2) the precentor, presiding over the choir and musical arrangements; (3) the chancellor, who superintended the religious and literary instruction of the younger members, took care of the library, and wrote the letters; (4) the treasurer, to whom were intrusted, not the money of the church (as might appear from the modern use of the word), but its sacred vessels, altar furniture, reliquaries, and similar treasures. II. In addition to these dignitaries, a cathedral chapter consisted of a board of officers called canons; some of them who enjoyed a separate estate (præbenda) in addition to their share of the corporate funds were called prebendaries. In the Middle Ages an attempt was made to impose on them, in part, monastic rules with dining hall and lodging rooms in common; but the restriction was never acceptable and was gradually given up. Monastic cathedrals closely resembled other monasteries, except that in the almost constant absence of the bishop—their nominal abbot—they were governed by a prior. With the suppression of the monasteries by Henry VIII (1534-38) the monastic cathedrals were "secularized" and thus placed on a "new foundation," which characterization they still retain, the originally secular cathedrals being called "of the old foundation." The continental European cathedrals were governed in the same general manner as the English, but only in the rarest instances was a cathedral chapter monastic and its head at once an abbot and a bishop.

At present all dioceses of the Roman Catholic church in the United States, and many dioceses of the Protestant Episcopal church, have cathedrals. The finest specimen of cathedral archi-

tecture at present existing in this country is St. Patrick's Roman Catholic Cathedral, in New York City, begun in 1858 and practically completed in 1889, at a cost of some \$2,500,000. It will, however, be surpassed in size and in magnificence by the new Protestant Episcopal Cathedral of St. John the Divine, in the same city, of which the choir and apse chapels have been completed and the crossing inclosed. Consult article "Cathédrale" in Viollet-le-Duc, *Dictionnaire raisonné de l'architecture française* (Paris, 1876); Van Rensselaer, *English Cathedrals* (New York, 1893); Pratt, *Cathedral Churches of England* (New York, 1910); Scott, *An Essay on English Church Architecture* (London, 1881); Wilson, *French Cathedrals* (New York, 1900); Barr Ferree, *Chronology of French Cathedrals* (New York, 1894); Gade, *Spanish Cathedrals* (Boston and New York, 1911); Lübke, *Ecclesiastical Art in Germany* (Edinburgh, 1873).

CATHEDRAL, THE. A poem by James Russell Lowell, published in Boston in 1869. It is a description of a day spent before the famous cathedral in Chartres, France.

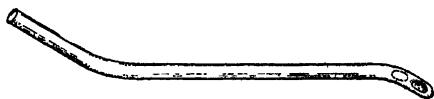
CATHELINEAU, kă't'-'lé'nô', JACQUES (1759-93). A leader of the insurgents in La Vendée during the French Revolution. He was born in very humble life, at Pin-en-Mauges, in the Department of Maine-et-Loire. For two years before the Vendean insurrection broke out at Saint-Florent, Cathelineau was busy organizing the peasants and providing them with weapons. When the open conflict came, he led a body of 3000 men, and in company with Bonchamp and Elbéès captured several towns. After the victory of Saumur (q.v.), the council of generals appointed him, as having the greatest influence over his countrymen, commander in chief. He immediately determined to make an attack upon Nantes and managed to penetrate into the town, where he was wounded by a musket ball, whereupon his troops dispersed. He was carried to Saint-Florent, where he died July 11, 1793. He was a man of great simplicity and honesty of character, and for his piety was called the "Saint of Anjou." Consult La Porte, *La légende de Cathelineau* (Paris, 1893), and Muret, *Vie populaire de Cathelineau* (Paris, 1845).

CATHERINE. See CATHARINE.

CATHERWOOD, MARY HARTWELL (1847-1902). An American novelist, born at Luray, Ohio. After graduating from the College at Granville, Ohio (1868), she settled at Newburgh-on-the-Hudson, where she began writing stories for the magazines. To this period belong several good novels, among which may be cited *Cracque o' Doom* (1881). Soon afterward she began a series of successful historical romances illustrating French Canada. They comprise mainly: *The Romance of Dollard* (1889); *The Story of Tonty*, into which is introduced La Salle (1890); *The Lady of Fort St. John* (1891); *The Chase of St. Castin, and Other Stories of the French in the New World* (1894); and *Macinac and Lake Stories*, dealing with the mixed settlements in the islands of the Great Lakes (1899). In a similar manner Mrs. Catherwood wrote of Illinois and the neighboring States in *Old Kaskaskia* (1893); *The Spirit of an Illinois Town*, a delightful story of two generations ago (1897); *Little Renault* (1897); *Spanish Peggy* (1899); *The Queen of the Swamp, and Other Plain Americans*, a collection of short stories of life in the Middle West a century ago (1899); and *Lazarre*

(1901). She also made a careful and appreciative study of the Maid of Orleans in *The Days of Jeanne D'Arc* (1897). Mrs. Catherwood's interest in French North America naturally led her from fiction to history. Her *Heroes of the Middle West* (1898) is an account of the French occupation from 1673 to 1763.

CATH'ETER (Lat., from Gk. καθήρ, *kathēter*, from καθέρω, *kathetos*, lowered, perpendicular, from κατά, *kata*, down + λέω, *lienai*, to



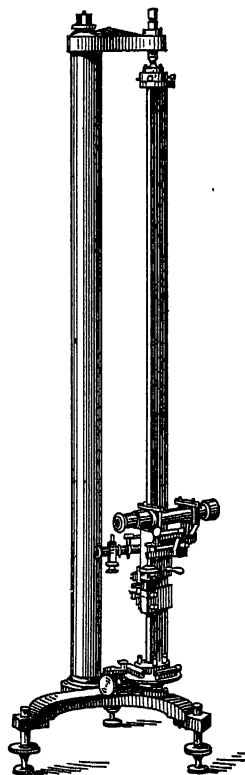
CATHETER.

send). A surgical instrument in the form of a tube, used for insertion into a mucous canal. The term is generally applied to a tube used to pass through the urethra into the bladder, for the purpose of drawing the urine; but there is also a catheter which is passed into the Eustachian tube and a catheter which is passed from the bladder through the ureter into the pelvis of the kidney. Urinary catheters are made of silver, glass, or rubber. Woven linen, impregnated with gum elastic, is also used as a material for making catheters, and such an instrument is generally used with a stiff wire, called a stylet, in its lumen, the stylet being withdrawn after the instrument is in place. The catheter in ordinary use is made of silver or

soft rubber, the latter being less liable to do injury or to give pain in the male patient. For the male the length of a catheter should be about 10 inches with a curve of 2 inches at the extremity, if of metal. For the female, the catheter should measure about 5 inches, with a slight curve of half an inch at the extremity, if of metal.

CATH'ETOM'ETER

(Gk. καθήρ, *kathetos*, vertical + μέτρον, *metron*, measure). A physical instrument employed in the exact measurement of vertical distances, such as the height of a column of liquid in a glass tube or the elongation of a wire. The cathetometer is employed extensively in the exact reading of a standard barometer and other measuring apparatus. It is constructed in numerous forms, but in general it consists of a vertical staff of metal so mounted on a base with foot screws that it can be leveled and



CATHETOMETER.

made to assume a truly vertical position. On this rod slides a carriage on which is mounted a small telescope with cross hairs accurately

adjusted in its axis. This telescope can be so arranged that it can move through any horizontal plane which is perpendicular to the axis of the upright supporting rod. The telescope is directed at an object or point whose vertical distance from another object or point it is desired to obtain. The adjustment is usually made by micrometer screws, and the carriage with its telescope raised and lowered until the point is bisected by cross hairs. The distance may be read off either on the rod itself by means of suitable microscopes and verniers or on an auxiliary scale on which the telescope or auxiliary microscope may be focused and whose graduations and coefficients of expansion are accurately known. The adjustments of the cathetometer are somewhat similar to those of an engineer's level, and the different instruments vary with different makers and investigators. A typical instrument is shown in the illustration.

CATH'ODE RAYS. These rays are described in that portion of the article which discusses discharge through gases. See ELECTRICITY.

CATHOLIC APOSTOLIC CHURCH. The proper designation of a body of Christians who object to any designation which implies sectarianism, and therefore to their common designation, "Irvingites," which is given to them from their connection with Rev. Edward Irving. In the winter of 1829-30 Irving, then a minister of the Scotch Church, Regent Square, London, delivered a series of lectures on spiritual gifts, in which he maintained that those which we are in the habit of calling "extraordinary" or "miraculous" were not meant to be confined to the primitive Church, but to be continued through the whole period of the present dispensation. About the same time, as if to confirm the views of the great preacher, there occurred at Port Glasgow, in the west of Scotland, certain strange phenomena. It was alleged that miraculous acts of healing had happened and that the gift of tongues had reappeared. After what seemed to be a sufficient investigation on the part of some of the members of Irving's church, it was concluded that the manifestations were genuine. Similar manifestations shortly after occurred in his own church, which were also pronounced to be genuine. They were held to be of two kinds: first, speaking in tongues, and, second, prophesying. As the former bore no resemblance to any language with which men were conversant, it was believed to be strictly an "unknown tongue," the Holy Ghost "using the tongue of man in a manner which neither his own intellect could dictate nor that of any other man comprehend." The latter, "prophesying," consisted chiefly of "exhortations to holiness, interpretations of Scripture, openings of prophecy, and explanations of symbols." After some time Irving was deposed from his office for heresy by the Church of Scotland, but meanwhile the religious opinions with which his name is associated had been assuming a more definite and ecclesiastical shape. The final result, after Irving's death, was the *Catholic Apostolic Church*, the constitution of which is briefly as follows:

There are, as in the apostolic times, *four* ministries: first, that of "apostle"; second, that of "prophet"; third, that of "evangelist"; and fourth, that of "angel." The apostles are invested with spiritual prerogatives; they alone can minister the Holy Ghost by the laying on

of hands; to them the mysteries of God are revealed and unfolded to the Church; and they decide on matters of order and discipline. Nothing that occurs in any church in the way of "prophetic utterance" can be authoritatively explained save by them; and the various "angels of the churches" are bound to bring all such utterances under their cognizance, in order that they may be rightly interpreted. The function of the "prophet" has been already indicated. The work of an "evangelist" mainly consists in endeavoring to bring in those who are without. The "angel" of the Catholic Apostolic church corresponds with the pastor of other Christian denominations. The ministers of each full congregation comprise an angel, with a four-fold ministry (consisting of elders, prophets, evangelists, and pastors), and a ministry of deacons to take charge of temporal matters. This ministry is supported by the tithes of the people. Church affairs are managed by a council of ministers of all classes, whose selection and arrangement are conceived to have been foreshadowed in the structure of the Mosaic tabernacle.

The Catholic Apostolic church holds with other Christian bodies the common doctrines of the Christian religion; it only accepts, in what it considers to be a fuller and more real sense, the *phenomena* of Christian life. It believes that the wonder, mystery, and miracle of the Apostolic times were not accidental, but are essential to the divinely instituted Church of God, and its main function is to prepare a people for the second advent of Christ. A very special feature of the Catholic Apostolic church is its extensive and elaborate symbolism. The doctrine of the objective presence in the sacrament of the Lord's Supper is held, but both transubstantiation and consubstantiation are repudiated.

The Catholic Apostolic church has spread from England to the Continent, but it continues a small body. In the United States (1913) it has 11 churches. Consult G. Miller, *History and Doctrines of Irvingism* (London, 1878), and Frommel, *Irvingianismus und Secte* (Bremen, 1885).

CATHOLIC BENEVOLENT LEGION. A fraternal organization in the United States whose object is to unite for social and benevolent purposes Roman Catholic men between the ages of 18 and 55. It was organized in 1881 and up to 1914 had distributed over \$22,000,000 to the beneficiaries of deceased members. It has five State and 358 subordinate councils; its membership in 1913 was 15,743. There is also an organization for women on parallel lines, known as the Catholic Women's Benevolent Legion.

CATHOLIC CHURCH (Lat. *catholicus*, Gk. *katholikós*, *katholikós*, general, universal, from *katá*, *kata*, according to + *hós*, *holos*, whole). The phrase "Catholic Church" includes the two-fold idea of extension and complete possession of revealed truth, but, from the beginning of its history, has been used to mark the difference between the orthodox Christian Church and the various sects which sprang from it. The name has been retained by the Church of Rome in the West, and in the creeds of the Anglican communion, and by the "Orthodox" Greek church in the East, as being the historic successors of the ancient Catholic church. The Protestant churches have held that the etymological meaning is legitimate, and that the word may be used of the Church universal. The term "Catholic" applied to the church means that at

every period of her existence after the adequate diffusion of the gospel she must extend *morally* throughout the whole world and be everywhere the same.

CATHOLIC CREDITOR. In the law of Scotland, one whose debt is secured by a lien or charge on more than one item of property belonging to the debtor, e.g., on two or more heritable estates for the same debt. The catholic creditor is bound so to exercise his right as not unnecessarily to injure the securities of other creditors. Thus, if he draw his whole debt from one piece of property, he must assign his security over the rest to the postponed creditors. The right of such a creditor is called a *catholic right*. Consult Erskine, *Principles of the Laws of Scotland* (Edinburgh, 1881). For the corresponding principle of the English and American law, see MARSHALING.

CATHOLIC EMANCIPATION ACT. See ROMAN CATHOLIC EMANCIPATION ACT.

CATHOLIC EPISTLES. A group of seven letters in the New Testament (James, 1, 2 Peter, Jude, 1, 2, 3 John) which have been designated by this name, as denoting the comprehensive circle of the readers addressed, in distinction from the individual churches and persons addressed in the letters by Paul. The term was first used in the Eastern church, about the second century, and then only with reference to 1 John, which was so named in contrast with 2 and 3 John, as private letters. Later it was applied to 2 Peter and Jude, as relatively general in their addresses; then to James and 1 Peter, as addressed to large portions of the Church; and finally 2 and 3 John were included, either on the supposition that the names given in their addresses (2 John, "the elect lady and her children," 3 John, "Gaius, the beloved") were figurative designations of the Church, or under the impulse to gather all of John's letters in the same group. The term was also used of writings outside the canon (e.g., by Origen, of the Epistle of Barnabas) and even of heretical writings (e.g., by Apollonius [in Eusebius, H. E. vii, 25], of the Epistle of the Montanist Themiston). Cyril of Alexandria applies it to the letter of the Church of Jerusalem, given in Acts xv. By the fourth century it had come to designate in the East the present group of seven letters. In the West these writings were not known by any group name until the fifth or sixth century, and then the name which was given them was *Canonical*.

Bibliography. B. F. Westcott, *A General Survey of the History of the Canon of the New Testament* (6th ed., Cambridge, 1889); A. H. Charteris, *The New Testament Scriptures*, Croall Lectures for 1882 (New York, 1882). See JAMES, EPISTLE OF; PETER, EPISTLES OF; JOHN, EPISTLES OF; JUDE, EPISTLE OF.

CATHOLIC KNIGHTS OF AMERICA. A Roman Catholic fraternal order founded in 1877 at the suggestion of Archbishop Feehan, then Bishop of Nashville, for the purpose of providing Roman Catholic men with the same advantages as were offered to others in the fraternal organizations outside their church. It is the pioneer of the Roman Catholic assessment insurance organizations, and the only one which admits women to membership on the same footing as men. There were, in 1913, 540 subordinate councils, with a membership of 19,000; it also has a uniform rank, with a membership of 2000. Up to 1914 it has paid about \$18,000,000 to the

beneficiaries of its deceased members, and it was the first organization to adopt the plan of a reserve fund to insure the meeting of its obligations. Its membership is limited to Catholics in good standing.

CATHOLIC MAJESTY, His Most. One of the formal designations of the King of Spain. It was given to Ferdinand V of Aragon and Castile by Pope Alexander VI and retained by later kings.

CATHOLICON AN'GLICON (Neo-Lat., from Gk. καθολικός, *katholikos*, universal + Ἀγγλικός, *Anglikos*, relating to England, from Lat. *Angli*, English). The title of an old Latin-English wordbook or dictionary, edited by S. J. H. Hertridge for the early English Text Society (London, 1881). The original text dates from 1483 and is supposed by the editor to have originated in the East Riding of Yorkshire.

CATHOLICOS (Neo-Lat., from Gk. καθολικός, *katholikos*, universal). The title of the chief ecclesiastic in the hierarchy of the Armenian, Nestorian, Abyssinian, and Jacobite churches and of the Christians of Georgia and Ethiopia.

CATHOLICS, ROMAN. See ROMAN CATHOLIC CHURCH.

CATHOLIC SUMMER SCHOOL OF AMERICA. A Roman Catholic school which was opened at New London, Conn., in the summer of 1892. Afterward a site was acquired at Cliff Haven, near Plattsburg, N. Y., on Lake Champlain, upon which adequate buildings were erected. The school is conducted in general along plans of the Chautauqua Summer School. (See CHAUTAUQUA.) It is designed to afford recreation and to give the Catholic point of view upon issues of the day in history, literature, philosophy, political science, and religion. It is in a measure an outgrowth of the Catholic Educational Union formed in 1889. The school is held annually from July to September, and its work is continued throughout the year by means of reading circles and study clubs on the University Extension Plan. The official organ is *Mosher's Magazine*. The president in 1914 was Rev. John F. Chidwick, D.D.

CATHOLIC TOTAL ABSTINENCE UNION OF AMERICA. A confederation of all the total abstinence organizations under Roman Catholic auspices, whether men's, women's, or juvenile. It was organized in 1872 on a strictly religious basis, requiring its members to go to Holy Communion at least once a year and recommending them to go four times. It was approved by Pope Leo XIII in 1887, and still earlier by the Third Plenary Council of Baltimore, which warned Catholics engaged in the sale of intoxicating drinks to consider seriously by how many and how great dangers, by how many and how great occasions of sin, their business, though in itself not unlawful, is surrounded. Urging them, if possible, to choose a more becoming way of making a living, it insisted that they should, at any rate, observe strictly certain regulations of decency and morality, and admonished them solemnly that "if through their culpable neglect or coöperation religion is brought into contempt or men brought to ruin, there is an Avenger in Heaven who will surely exact from them the severest penalties." Unlike many other societies, this Union does not assert that the use of intoxicants is wrong in itself, but maintains that for many it is a proximate occasion of sin, and must by them be abandoned altogether; and without insisting upon total abstinence as necessary for every one,

regards it as one of the strongest weapons against the widespread evil of intemperance and urges it upon those who wish to suppress this evil. At the present time the Union numbers over 100,000 members.

CATHOLIC UNIVERSITY OF AMERICA. An institution of higher learning at Washington, D. C., conducted under the auspices of the Roman Catholic church in the United States. The university was incorporated and received its apostolic constitution from Pope Leo XIII in 1887 and was opened for instruction in 1889. It is governed by a self-perpetuating board of trustees, chosen from the episcopate, clergy, and laity. The chief executive officers are the chancellor, the rector, and the treasurer. The courses of study are intended primarily to give professional training and to offer facilities for original research to graduates of Catholic seminaries and colleges. The faculties at present organized are those of theology, philosophy, letters, and sciences, comprising altogether 74 professors and instructors. In the Teachers' College (opened 1911) courses on academic and professional subjects are given by university instructors to members of the teaching sisterhoods. The Summer School (six weeks' session) is also organized to meet the needs of teachers. The total number of students in 1912-13 was 1037. The university has 20 endowed chairs, 4 endowed fellowships, and 40 endowed scholarships. The total value of its property and investments was \$2,682,600. Its library contains approximately 100,000 volumes, exclusive of pamphlets. Affiliated to the university, though retaining separate organizations, are the College of St. Thomas Aquinas, the Marist College, the Holy Cross College, the College of the Holy Land, the College of St. Austin, the Immaculate Conception College, and Trinity College (for women). St. Paul Seminary, St. Paul, Minn., is also affiliated under the clause of the university's constitution providing for the affiliation of Catholic seminaries and colleges in the United States. Cardinal Gibbons has been chancellor of the university since its foundation. The Right Rev. John J. Keane was rector till 1896, the Right Rev. Monsignor Thomas J. Conaty till 1902, Monsignor Dennis J. O'Connell till 1909. He was succeeded by the Right Rev. Thomas J. Shahan. Consult *Catholic University of America Year Book* (Washington, 1893 et seq.) and *Catholic University Bulletin* (Washington, 1895 et seq.).

CATHOLIC YOUNG MEN'S NATIONAL UNION. A federation of the diocesan unions of young men among Roman Catholics in the United States. It was organized at Newark, N. J., in 1875, and Monsignor George H. Doane, rector of the procatheedral in that city, was elected its first president. It was formally approved by the Third Plenary Council of Baltimore in 1878 and had in 1914 about 35,000 members. Among its presidents have been such distinguished ecclesiastics as Archbishop Kain, of St. Louis, Monsignor Loughlin, of Philadelphia, and Monsignor Laval, of New York. It has shown its practical usefulness not only by consolidating and framing constitutions for diocesan unions, but by the establishment of libraries, reading rooms, and night schools, and the provision of good reading matter for soldiers and sailors.

CATILINE (LUCIUS SERGIUS CATILINA) (c.108-62 B.C.). A Roman noble celebrated as the leader of a conspiracy against the Republic.

During his youth he attached himself to the party of Sulla. According to the ancient accounts, which all come from his opponents of the aristocratic party, his bodily constitution, allied to a mind which could stoop to every baseness and feared no crime, fitted him to take the lead in the conspiracy which has made his name infamous. In the year 68 B.C. he was elected praetor; in 67 he was Governor of Africa; and in 66 he was a candidate for the consulship, but was disqualified by accusations of maladministration in his province. Disappointed thus in his ambition and burdened with many and heavy debts he entered into a conspiracy, including many other young Roman nobles, in morals and circumstances greatly like himself, to effect a political revolution. A plan to murder the consuls of 65 B.C. at their inauguration, and a later effort to kill them in February, 65, failed. Presently a new plot was laid, but this was revealed to Cicero, then consul, by Fulvia, mistress of one of the conspirators. In the night of Nov. 6, 63, Catiline explained to his confederates his plans for assassinating Cicero; for bringing up the Tuscan army (which he had seduced from its allegiance), under Manlius, from the encampment at Fesulæ (Fiesole); for setting fire to Rome and putting to death hostile senators and citizens. In a few hours everything was known to Cicero. Accordingly, when the chosen assassins came to his house, on pretense of a visit, they were immediately repulsed. On November 8, when Catiline audaciously appeared in the Senate, Cicero, who had learned that the insurrection had broken out in Etruria, delivered his First Oration Against Catiline. The accused was abashed by the minute knowledge Cicero displayed of the conspiracy. After an attempt at reply, he abruptly left the Senate and escaped from Rome during the night. Catiline and Manlius were now denounced as traitors, and an army under the consul Antonius was sent against them. The conspirators who remained in Rome, the chief of whom was Lentulus, were arrested, tried, condemned, and executed, December 5. The insurrections in several parts of Italy were meanwhile suppressed; many who had resorted to Catiline's camp in Etruria deserted when they heard what had taken place in Rome, and his intention to proceed into Gaul was frustrated. In January, 62, having returned by Pistorium (now Pistoja) into Etruria, he encountered the forces under Antonius, and after a desperate battle, in which he displayed almost superhuman courage and enthusiasm, was defeated and slain. For the conventional history of the conspiracy, consult: *Bellum Catilinæ* of Sallust; Cicero's four *Orations Against Catiline*; the biographies "Cæsar," and "Cicero," in Plutarch's *Lives*; in defense of Catiline consult E. S. Beesley, "Catiline as a Party Leader," *Fortnightly Review* (June, 1865).

CATILINE, HIS CONSPIRACY. A tragedy by Ben Jonson, played in 1611 and published in quarto the same year. A folio edition appeared in 1616 and a second quarto in 1635. It held the stage only to the close of the century and is a ponderous adaptation of the treasonous practices of Catiline.

CATILINE'S CONSPIRACIES. 1. A play by Stephen Gosson (q.v.), written and probably played in London about 1579. The piece has not come down to us, nor is there any record of its having ever been printed. 2. A play by Robert Wilson and Henry Chettle. It is not

extant, but a reference to it in Lodge's *Defense of Poetry*, published in 1580, would put its appearance before that date. There is a record of another *Catiline* by these authors.

CATINA, or **CAT'ANA**. See **CATANIA**.

CATINAT, kâ'té'nâ', NICOLAS DE (1637-1712). A French soldier, born in Paris. He distinguished himself at the sieges of Lille (1667) and of Maestricht (1673). In 1686, contrary to his wishes, he was sent against the Waldenses. He was made lieutenant general in 1688. The Duke of Savoy he defeated at Staffarda in 1690. He was promoted to be a marshal of France in 1693 for his victory at Marsaglia, but in 1701 was worsted by Prince Eugene at Carpi, and was superseded by Villeroi, under whom he served at Chiari. He was a follower of Turenne in strategy; in infantry tactics he attempted to perfect the charge, ordering his troops to endure the enemy's first discharge, coming to close quarters before firing. Consult his memoirs (Paris, 1819) and the biography (1902) by De Broglie.

CATIN'GA (South American word). The forests of the very dry lands of the interior of Brazil are called "cattinga forests." They contain an unusual collection of trees with barrel-shaped trunks, as the cotton tree and many thorny trees. See **FORESTS**.

CAT ISLAND. One of the Bahama Islands, long and narrow in shape, but wide at its southern extremity. It was supposed by some to be the first landing place of Columbus on his voyage to the New World in 1492; but San Salvador, or Watling's, Island to the east has the better claim. It is 36 miles long and from 2½ to 7 wide.

CATKIN. See **AMENT**, and illustration in article **ALDER**.

CATLETTSBURG. A city and the county seat of Boyd Co., Ky., at the confluence of the Ohio and Big Sandy rivers, the latter forming the boundary between Kentucky and West Virginia (Map: Kentucky, H 2). The city is on the Chesapeake and Ohio Railroad. It has a considerable trade in lumber and contains wholesale groceries, shoe and hardware houses, saw and flour mills, machine shops, etc. Pop., 1890, 1374; 1900, 3081; 1910, 3520.

CATLIN, GEORGE (1796-1872). A traveler and writer and painter of Indian portraits, born in Wilkesbarre, Pa. He studied law, but, having a taste for art, became a portrait painter. Having conceived the idea of executing a gallery of Indian paintings in order to rescue from oblivion the various types and customs of the aborigines, he began in 1832 a series of travels extending over eight years among the wildest tribes of North and South America, resulting in a collection of some hundreds of Indian pictures painted by himself, together with several books descriptive of Indian scenes and customs. Most of the portraits, after having been exhibited by the artist in the United States and Europe, finally came into possession of the government and now constitute the famous "Catlin Gallery" of the National Museum. Some 400 sketches are owned by the American Museum of Natural History, New York City. Consult Miner, *George Catlin*, with an Annotated Bibliography of his Writings (New York, 1901); *My Life Among the Indians*, ed. by M. G. Humphreys (1909).

CATLINITE, kât'lin-it (after Catlin, the American traveler and artist). A hardened clay of reddish color found in Pipestone Co., Minn.,

which was used by the Dakota Indians for the manufacture of pipes.

CATNIP (probably a corruption of *catmint*, cat's mint, by popular confusion with *nip*, Ger. *kneifen*, Lith. *knėbti*, to pinch; hardly connected with Lat. *nepeta*, catnip), or **CATMINT** (*Nepeta cataria*). A plant of the family Labiatae, remarkable for the fondness which cats display for it. It is common in England, in chalky and gravelly soils, but less abundant in Scotland and Ireland, and is widely diffused throughout Europe and the middle latitudes of Asia and of North America. It affects cats in much the same manner as does valerian root, and when its leaves are bruised so as to be highly odoriferous, they are at once attracted to it, rub themselves on it, tear at it, and chew it. Its odor has been described as intermediate between that of mint and that of pennyroyal. It has erect stems, 2 to 3 feet high, dense whorls of many whitish flowers, tinged and spotted with rose color or purple, and stalked, heart-shaped leaves of a velvety softness, whitish and downy beneath. Other species are numerous in the south of Europe and middle latitudes of Asia. For illustration, see **DICOTYLEDONS**.

CATO. The title of a tragedy by Addison (1713), the scene of which was laid in Utica, whither Cato the Younger had retired after the successes of Cæsar.

CATO, DIONYSIUS. The name given to an imaginary person, long accounted author of a little volume of moral precepts in prose and verse, known as *Dionysii Catonis Disticha* (or *Dicta*) *de Moribus ad Filium*. In its present form it belongs, in general, to the third century A.D.; parts of it are much earlier, however. It begins with a preface addressed by the author to his son, after which come, in prose, 56 simple injunctions, such as *parentem ama*. This is followed by the main portion of the book—164 moral precepts, each in two dactylic hexameters. During the Middle Ages the work was a great favorite and was used as a textbook for young scholars. In the fifteenth century more than 30 editions were printed. An English translation was published by Caxton (1483). For a modern edition, consult Hauthal (Berlin, 1869) and G. Némethy (Budapest, 1905).

CATO, MARCUS PORCIUS (234–149 B.C.). A Roman statesman, surnamed *Censorius* and *Sapient* (the wise), afterward known as **CATO PRISCUS**, or **CATO MAJOR** (Cato the Elder), to distinguish him from Cato of Utica. He was born near Tusculum, where the modern village of Monte Porzio Catone perpetuates his memory. Having inherited from his plebeian father a small farm in the Sabine country, he busied himself in agricultural operations and learned to love the simple and severe manners of his Roman forefathers. Induced by Lucius Valerius Flaccus to remove to Rome, Cato denounced the purposes and the degeneracy (so he called it) of the Philo-Hellenic party, then becoming prominent, and set a pattern of sterner and purer character. He soon distinguished himself as a pleader, and, after passing through minor offices, was elected consul (195 B.C.). In his Province of Hither Spain Cato was so successful in restoring order and displayed such military genius that he was honored by a triumph (194).

In 184 Cato was elected censor and discharged so rigorously the duties of his office that the epithet *Censorius*, formerly applied to all holders of that office, was made his distinctive surname.

He repaired the watercourses, bricked the reservoirs, cleansed the drains, increased the sums paid by the *publicani* (q.v.) for the farming of the taxes, and diminished the prices paid by the state to the contractors of public works. More questionable attempts at reforms were those in regard to restricting the prices that might legally be paid for slaves, dress, furniture, equipage, etc. Cato was a thoroughly dogmatic moralist, intolerant and stoical; great because he manfully contended with rapidly growing evils, yet not wise, because he opposed both bad and good innovations with equal animosity. He was always scrupulously honest.

In 175 B.C. Cato was sent to Carthage to help settle the differences between the Carthaginians and the Numidian King Masinissa; but having been offended by the Carthaginians, he returned to Rome, where, ever afterward, he described Carthage as the most formidable rival of the Empire, and concluded all his addresses in the Senate house—whatever the immediate subject might be—with the well-known words: "Ceterum censeo Carthaginem esse delendam" ('Moreover, I believe that Carthage must be destroyed').

Though Cato was early acquainted with the Greek language and its literature, his reactionary principles led him to denounce the latter as injurious to national morals. In his eightieth year his second wife, Salonia, bore him a son, the grandfather of Cato of Utica. He composed various literary works, such as *De Agri Cultura* (or *De Re Rustica*), which has been preserved entire. The best edition is by Keil (Leipzig, 1884). His greatest historical work, the *Origines*, in 7 books, has, unfortunately, perished. It was called *Origines* because, in addition to the history of Rome, it described the origins of the Italian towns with which Rome had come in contact. Fragments of Cato's orations—of which 150 were read by Cicero—are given in Meyer's *Oratorum Romanorum Fragmenta* (Zurich, 1842). As an orator, Cato was very famous, his style being natural, forcible, and racy to a degree. See Sears, *History of Oratory* (Chicago, 1896). For the fragments consult the edition by Jordan (Leipzig, 1860); also H. Peter, *Historicorum Romanorum Fragmenta* (Leipzig, 1870). For a translation of *De Agri Cultura*, see *Roman Farm Management: The Treatises of Varro and Cato done into English*, by a Virginia Farmer (New York, 1913).

CATO, MARCUS PORCIUS, known as **CATO THE YOUNGER**, or **CATO UTICENSIS** (from the place of his death) (95–46 B.C.). A Roman statesman and soldier. Having lost both parents during childhood, he was educated in the house of his uncle, M. Livius Drusus, and even in boyhood gave proofs of decision and strength of character. In 72 he served with distinction in the campaign against Spartacus, but without finding satisfaction in military life, though he proved himself a good soldier. From Macedonia, where he was military tribune in 67, he went to Pergamus. Thence he brought the Stoic philosopher Athenodorus to his camp and later to Rome, where he spent the time partly in philosophical studies and partly in forensic discussions. To qualify himself thoroughly for the quaestorship, he studied all the financial questions connected with it. Immediately after his election to this position (65) he introduced, in spite of violent opposition from those interested, a rigorous reform into the treasury offices. He quitted the quaestorship at the appointed time amid general approbation. In

63 he was elected tribune and delivered his famous speech on the Catilinarian conspiracy, in which he denounced Cæsar as an accomplice of Catiline and determined the sentence of the Senate. Strongly dreading the influence of unbridled greatness, he opposed consistently the most powerful men in Rome—Pompeius, Cæsar, and Crassus. Cato was a noble but strait-laced theorist, who lacked the intuition which belongs to men like Cæsar and Cromwell. His first opposition to Pompeius was successful; but his opposition to Cæsar's consulate for the year 59 was of no avail. Soon after the Triumvirs, to rid themselves of his interference, ordered him to proceed to Cyprus and take possession of that island for Rome (58). On his return (56) he was elected prætor, a position in which he fearlessly fought corruption. When the open breach came between Cæsar and Pompeius, Cato sided with the opponents of Cæsar. At the time of the battle of Pharsalus (48) he was holding Dyrrhachium for Pompey. After the disaster he sailed for Africa with his troops to join Pompey. Before his landing the Triumvir had been murdered. Cato was elected commander by the Pompeians in Africa, but resigned the post in favor of Metellus Scipio and undertook the defense of Utica. Here, when he had tidings of Cæsar's decisive victory over Scipio and Juba at Thapsus (April 6, 46), finding that his troops were wholly intimidated, he advised the Roman senators and knights to escape from Utica and make terms with the victor, but prohibited all intercessions in his own favor. Resolved to die rather than surrender, after spending the night in reading Plato's *Phædo*, he committed suicide by stabbing himself in the breast.

CATO, PUBLIUS VALERIUS, known as **CATO GRAMMATICUS**. A Roman grammarian and poet of the first century B.C. He lost his estate during the usurpation of Sulla, became an instructor to students of rank, and enjoyed great success, particularly as a trainer in the poetic art. Suetonius (*De Grammaticis*, 11) states that, in addition to works on grammar, he wrote a short autobiographical narrative entitled *Indignatio*, and some poems, of which two—*Lydia* and *Diana*—were chiefly esteemed. He favored the new school of poetry, which preferred mythological epics and elegies of the Alexandrian type to the national Latin epic and drama. The 183 hexameters called *Diræ in Batterum* were originally included in the minor poems of Vergil; later were attributed, with little reason, to Cato; and are now quite generally considered spurious. The text of the *Diræ* has been edited by Ribbeck (Kiel, 1867). Consult the essay by Næcke (Bonn, 1847).

CATOCHE, CAPE. See **CAPE CATOCHE**.

CATO MAJOR. See **DE SENECA**.

CATOPTRICS (Fr. *catoptrique*, Gk. *κατοπτρικός*, *katoptrikos*, pertaining to a mirror, from *κάτοπτρον*, *katoptron*, mirror). That branch of geometrical optics which treats of the phenomena of light incident upon a surface and reflected therefrom. See **LIGHT**.

CATOPTROMANCY (Gk. *κατοπτρον*, *katoptron*, mirror + *μαντεία*, *mantéia*, prophecy). Prophesying by means of a mirror or looking-glass. It originated at Patras, in Greece, where the death or recovery of the sick was foretold by means of a mirror let down with a thread until its base touched the water in a fountain before the Temple of Demeter. The face of the sick person appearing healthy in the mirror be-

tokened recovery; if it looked ghastly, death was sure to follow. More modern forms of this superstition are: attaching ill luck to the breaking of a looking-glass and to seeing one's face in a glass by candlelight. See **SUPERSTITION**.

CATORCE, *ká-tór'sá*, *Sp. pron. ká-tór'thá*, or **ALAMOS DE CATORCE**. A city of Mexico, situated in a barren district of the State of San Luis Potosí, 8700 feet above sea level, and 108 miles north of San Luis Potosí by rail (Map: Mexico, H 6). The town lies at the foot of a mountain 10,000 feet high and is famous for its silver mines, discovered in 1773. Pop., 1900, 17,820.

CATO STREET CONSPIRACY. See **THISTLEWOOD CONSPIRACY**.

CAT OWL (from the resemblance of the face to that of a cat). A name applied rather indiscriminately to several large owls, suggested by their catlike eyes and feline habits. In the United States, probably the barred owl (*Syrnium nebulosum*, or *Stria varia* as it is now called) is the one most often so referred to. See **OWL**.

CATRON, THOMAS BENTON (1840–1921). An American legislator, born in Lafayette Co., Mo. After graduating from the University of Missouri, he served four years in the Confederate army, took up the practice of law in New Mexico, and after two years as a member of the Legislative Assembly became Attorney-General of the Territory in 1869, resigning, however, to become United States Attorney. He was a member of the Legislative Council in 1884 and 1889, and in 1895–97 was delegate of New Mexico to the Fifty-fourth Congress. Upon the admission of New Mexico to the Union as a State he was elected United States Senator for the term 1912–17.

CATS, *káts*, **JAKOB** (1577–1680). The best of the southern Dutch poets in the golden age of that literature, while it was being illustrated in the north by the varied genius of Vondel, Hooft, and Vischer. His poetry is characteristically Dutch in being extremely prosaic, commonplace in its metres, jejune in language, monotonous in rhythms, and platitudinous in morals. A Dutch critic, Huet, has called him bitterly "a personified mediocrity, a vulgar and vulgarizing spirit," somewhat suggestive of the English Tupper. But he so well expressed the average mental life of his countrymen that for nearly two centuries his works ranked in popularity next to the Bible. Cats was the youngest of four children, and his mother died in his infancy. He was adopted by an uncle, studied law in Leyden, Orléans, and Paris, and began to practice it at The Hague, where he won reputation, but lost his health. He went to England, where he found no relief, and was at last cured in Holland by an alchemist. In 1603 he moved to Middelburg, and presently married Elizabeth van Valkenburg, whom he calls "a foundation for a home." Cats became active in civic life, and wrote his *Emblemata* ('Emblems of Fancy and Love'); *Maechdenplicht* ('Maiden Duty,' 1618); *Selfstryt* ('Inward Strife,' 1620); *Mannelyke achtbarheyd* ('Manly Respectability'); and *Houwelyck* ('Marriage'). In 1621 he entered public life as pensionary of Middelburg, became pensionary of Dort in 1623, and curator of the University of Leyden in 1625. In 1632 appeared *Spiegel van den Ouden en Nieuwen Tyt* ('Mirror of the Old and New Time'). In 1627 Cats went on an embassy to England, became Grand Pensionary of Holland in 1638, and Keeper of the Great Seal in 1648. These offices he resigned in 1651, and after a second embassy to England

returned to literary work, in which for 30 years he had done little save the *Trouwingh* ('Bethrothal Ring,' 1637). He now wrote *Ouderdom en Buitenleven* ('Age and Country Life'); *Hofgedachten* ('Court Thoughts'); and an autobiography in verse, *Twee en tachtigjarig leven* ('A Life of Eighty-two'), growing old gracefully and keeping a joy in life to the last. His *Collected Works* were published in Amsterdam (19 vols., 1790-1800) and Zwolle (1856-62). Consult Derudder, *Un poète néerlandais, C., sa vie et ses œuvres* (The Hague, 1899), and the biography by Kalff (Haarlem, 1902).

CAT'S CRADLE. See CRATCH CRADLE.

CAT'S-EYE. A semitransparent mineral which, when cut with a convex face (*en cabochon*), shows a chatoyant effect. The name has been given to a greenish variety of chrysoberyl from Ceylon, where the Singhalese often carve it to resemble a monkey's face, taking advantage of the varying lights and colors of the stone to secure a grotesque likeness to that animal. Among the Hindus the cat's-eye was credited with the power of preserving and increasing its owner's wealth. The name "cat's-eye" was suggested by the peculiar play of light called *chatoyancy*, which is due to the internal striations of the composite crystals of which the mineral consists. The name is also given to an opalescent variety of quartz, especially when similarly cut, the effect in which is said to be due to the fibres of asbestos or actinolite. A *tiger-eye* variety from the Orange River of South Africa is an altered crocidolite in which the fibrous iron silicate has been replaced by a deposition of chalcedonic quartz on the fibres.

CATSKILL. A village and the county seat of Greene Co., N. Y., 34 miles south of Albany, on the Hudson River, at the mouth of Catskill Creek, and on the West Shore Railroad (Map: New York, G 6). It is connected by steamboat lines with New York and Albany, and is the starting point of the Catskill Mountain Railroad. The village, frequented as a summer resort, though important rather as the point of departure for the more popular mountain resorts, has a courthouse, opera house, free academy, and public library. It manufactures woolens, hosiery, cut glass, bricks, etc., and is in a productive fruit-growing region. Catskill was settled about 1680 by Derrick Teunis Van Vechten. The village owns its water works. Pop., 1890, 4920; 1900, 5484; 1910, 5296.

CATSKILL AQUEDUCT. See AQUEDUCT.

CATSKILL FORMATION. A series of sandstones and shales of Upper Devonian age exposed along the western slopes of the northern Appalachian Mountains and named from the Catskill Mountains of New York, where they were first studied. The series was formerly supposed to constitute a distinct geological group overlying the Chemung formation, but careful investigation has shown that the rocks of the Catskill formation are shallow-water deposits formed along the shore lines of the northeast bay of the interior Devonian sea during periods while the normal marine sediments of the Hamilton, Portage, and Chemung formations were being laid down in the open and deeper waters that filled the western parts of the same bay. The name "Catskill formation," then, signifies a local littoral development or facies of the normal Upper Devonian formations, and as such it has no place in the geological time scale. These Catskill conditions and sediments began in the De-

vonian of the eastern border of the basin at an earlier period than they did in the central and western portions, for the shoaling of the Devonian sea progressed from east to west. Because of this the Lower Catskill deposits of the Catskill Mountain region are of Hamilton age, the middle Catskill of the eastern border and the Catskill of the east-central part of New York State are of Portage age and known as the Oneonta formation, while the Upper Catskill of the eastern border and the Catskill rocks of the central part of the State are of Chemung age.

The rocks of the Catskill formation consist of shale and sandstone, with the latter often grading into coarse conglomerates, and their predominant colors are red, brown, greenish, and steel gray. The sandstone, especially that of steel-gray color, often splits readily into thin horizontal layers and is then quarried for flagstone. The entire output of flagstone known as "Hudson River bluestone" is obtained from the Catskill formation of Ulster, Delaware, and Greene counties, N. Y. As a rule the Catskill rocks are poor in fossil remains. Those most commonly found are the remains of land plants such as ferns, lepidodendrons, and trunks of coniferous trees. The most noteworthy fossil from this formation is a gigantic arthropod, *Stylonurus* (q.v.), an ally of the horseshoe crab (*Limulus*), which attained a length of 5 feet. Fragments, consisting of the dermal plates, spines, and teeth, of heavily armored fishes of the genera *Bothriolepis*, *Coccosteus*, and *Holoptychius*, which lived in the brackish and fresh waters of the coastal swamps, are found in certain red beds. A fresh-water clam, *Amnigenia*, is found in sandy shales of the Oneonta formation, and occasional water-worn shells of marine mollusks and brachiopods occur in the lower beds of the Catskill Mountain region.

The Catskill sediments are approximately 3500 feet thick in the Catskill Mountains; they have their greatest development, with a thickness of 7500 feet, in the vicinity of Mauch Chunk, Pa., and from that region southward the formation diminishes in thickness until it disappears in Virginia. The formation is overlaid by the Pocono sandstones and conglomerates of similar origin, but of later (Carboniferous) age. The elevation of the continents that occurred towards the close of Devonian time was accompanied in Great Britain by the formation of very similar sediments there known as the Old Red Sandstone, made famous by the writings of Hugh Miller. This Old Red Sandstone bears to the normal marine Devonian of Great Britain the same relation as does the Catskill formation to the marine Devonian of eastern North America, and the similarity is still further marked in the identical physical characteristics of the rocks and the close resemblance of their contained fossil remains. See DEVONIAN SYSTEM; OLD RED SANDSTONE; STYLONURUS.

CATSKILL MOUNTAINS. A section of the Appalachian Mountain system, lying to the west of the Hudson River and mainly confined to Greene and Ulster counties, N. Y. They cover an area about 50 miles long, north and south, and 30 miles broad, east and west (Map: New York, F 6). They are of old geological formation, their sides consisting of the sandstones and shales of the Catskill group of the Devonian system. The main line of elevations, which begins about 8 miles west of the Hudson River, extends nearly north and south for a dis-

tance of 12 miles and sends off several spurs to the west. Unlike the southern ranges of the Appalachians, the Catskills are not formed by parallel groups of mountains, each peak being more or less isolated from the neighboring summits. The slopes on the eastern side are precipitous, but towards the west there is a gradual decline to the levels of the bordering highlands. The highest elevations are Slide Mountain, 4204 feet; Hunter Mountain, 4025 feet; Black Dome, 3990 feet; and Black Head, 3937 feet. Deep cloves, the Dutch name of gorges, have been eroded by the branches of the Schoharie and Esopus creeks, along the courses of which are many cascades. Railroads cross the region, giving access to all sections. The beautiful views, fine summer and autumnal climate, and high altitude make the region very popular as a resort. The mountains are for the most part covered with thick forests of oak, hickory, ash, maple, beech, pine, etc.

CATSKIN'S GARLAND, or **THE WANDERING YOUNG GENTLEWOMAN**. An old English ballad. It deals with the distress and restoration to happiness of a scullery maid, whose wretchedness is so great that she is obliged to clothe herself in catskins. It is really an Anglo-Saxon form of *Cinderella*.

CAT SNAKE. The English name of a venomous opisthoglyph serpent (*Tarbothis vivax*) of southeastern Europe and Asia Minor, remarkable for several peculiarities of structure. It is small, dull-colored, and sluggish, and has grooved poison fangs in the hinder part of the upper jaw. There are also long, recurved teeth in the lower jaw, which assist it in holding its prey (mainly lizards), while it chews at it until the venom stupefies the victim. See **OPISTHOGLYPHA**.

CAT'S-TAIL GRASS. See **TIMOTHY GRASS**.

CAT'S-TAIL REED. See **TYPHA**.

CATT, **CARRIE CHAPMAN**. An American suffrage leader and lecturer, born at Ripon, Wis. She was educated at the State Industrial College of Iowa and after graduation took a special course in law. For several years she was principal of the high school and general superintendent of schools at Mason City, Iowa. She was married in 1884 to Leo Chapman, who died two years later, and in 1890 to George William Catt, who died in 1905. From 1890 to 1892 she was State lecturer and organizer of the Iowa Woman Suffrage Association, and thereafter was identified with the National Woman Suffrage Association and the International Woman Suffrage Alliance, of which latter organization she became president. She lectured in nearly every State of the Union in behalf of woman suffrage, was especially prominent in the successful campaigns in Colorado and Idaho, aided in gaining for Louisiana women taxpayers the right to vote on all questions submitted to the taxpayers, and took an active part in the 1910 and 1911 State campaigns for woman suffrage. In addition to her work in the United States, she lectured in nearly every country in Europe. In April, 1913, she attended the International Woman Suffrage Congress at Budapest.

CATTARO, kăt'tă-rō (Slav. *Kotor*). A seaport of the Austrian Crownland of Dalmatia, situated at the head of the picturesque Gulf of Cattaro, close to the Montenegrin frontier, and about 36 miles east-southeast of Ragusa (Map: Austria, F 5). It is protected on the gulf side by powerful batteries and at its back tower lofty mountains on which stands the almost inaccessi-

ble Fort San Giovanni, almost 1000 feet above the town, with which it is connected by a series of defensive works. The principal trade is with Montenegro, with whose capital it is connected by a steep highway known as the Ladder or Stairs of Cattaro. Pop., 1890, 5400; 1900, 5700; in 1910, 6040. Cattaro, which was at one time a Roman colony under the name of Ascrivium, came in 1420 under the dominion of the Republic of Venice. In 1797 it passed to Austria, and in 1805 to the Kingdom of Italy, but was restored to Austria in 1814. The town has twice been demolished by earthquakes. See Verbonié, *History of the Gulf of Cattaro* (Agram, 1889).

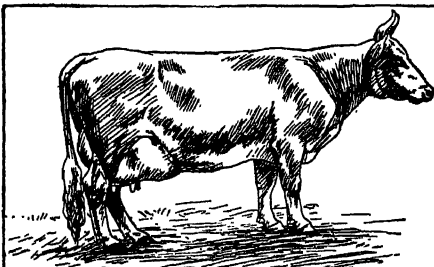
CATTARO, GULF OF, or **BOCCE DI CATTARO**. An inlet of the Adriatic, near the southern extremity of the Dalmatian coast, in lat. 42° 27' N. (Map: Austria, F 5). It consists of three basins connected by straits of about half a mile in breadth. The outer entrance is only a mile and a half wide, and the total length of the gulf is about 18 miles. Mountains protect it from all winds, and it has sufficient depth to make it an excellent harbor. The scenery is magnificent.

CATTEGAT, or **KATTEGAT** (ancient Lat. *Sinus Codanus*), THE. The strait or sound separating the east coast of Jutland, Denmark, from the west coast of Sweden, and, by joining the Skagerrak on the west and the Little and Great Belts and the Sound on the east, forming the middle link in the chain of waters connecting the Baltic with the North Sea (Map: Denmark, E 2). It is about 150 miles long and has a greatest width of about 90 miles. Its depths are very unequal, varying in the deepest portions in the western part from 40 to 65 feet and in the eastern part from 100 to 200 feet. It offers dangers to navigation on account of its numerous shoals and the frequency of stormy winds. Its principal islands are Läsö at the north, Anholt near the middle, and Samsö at the south. The eastern shores are steep and rocky, but those on the west are low.

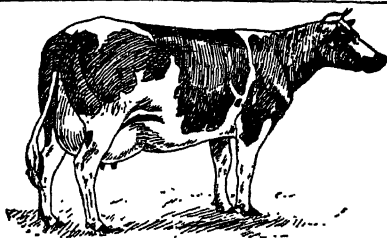
CATTELL, **HENRY WARE** (1862-). An American pathologist, born at Harrisburg, Pa. He was educated at Lafayette College and at the universities of Leipzig, Pennsylvania, and Freiburg (Baden). In 1892-97 he was demonstrator of morbid anatomy at the University of Pennsylvania, and in 1899-1901 director of the Ayer Chemical Laboratory in the Pennsylvania Hospital. He served as pathologist to various Philadelphia hospitals and was also called as an expert in several murder trials. He edited the *International Medical Magazine* in 1894-97; *International Clinics* in 1900-03 and after 1910; *Medical Notes and Queries* after 1905. Besides translating *Ziegler's Special Pathological Anatomy* (1896-97), and editing *Lippincott's Medical Dictionary* (1910; 3d ed., 1913), he is also author of *Notes on the Demonstrations in Morbid Anatomy* (1899-1901); *Post-Mortem Pathology* (1903; 3d ed., 1906); "606" (1910).

CATTELL, **JAMES McKEEN** (1860-). An American psychologist, born at Easton, Pa. He graduated at Lafayette College in 1880 and at the University of Leipzig in 1886 and was a lecturer at the University of Cambridge in 1888. From 1888 to 1891 he was professor of psychology at the University of Pennsylvania, from 1891 to 1896 professor of experimental psychology at Columbia University, from 1896 to 1902 head of the department of anthropology, and from 1902 to 1905 professor in the department of philosophy. After 1891 he served as pro-

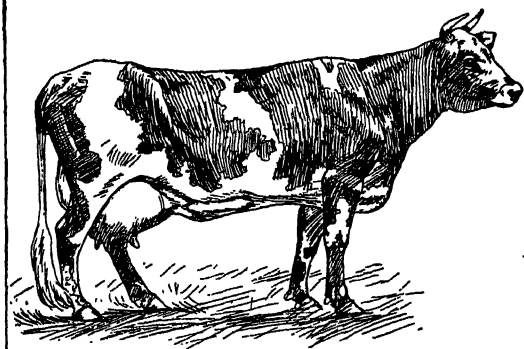
DAIRY CATTLE



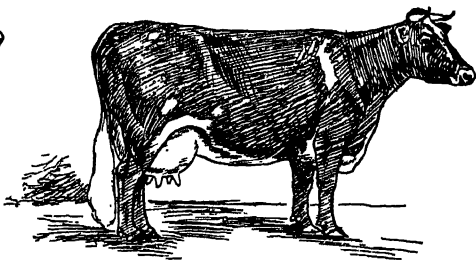
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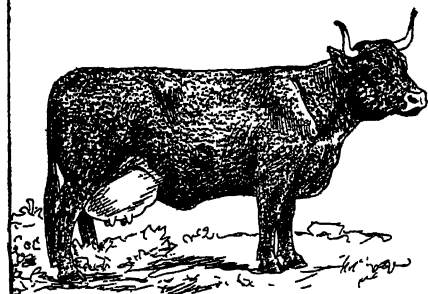
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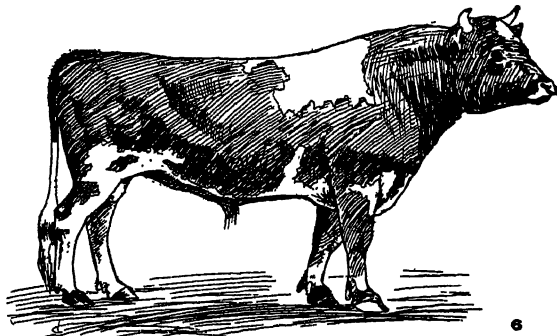
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1. AYRESHIRE COW, "Red Rose" No. 5566.

2. HOLSTEIN-FRISIAN COW, "Jamaica," No. 1336.

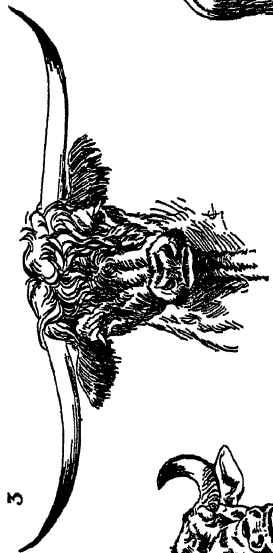
3. JERSEY COW, Modern type.

4. SHORT-HORN COW, "Kitty Clay," 4th.

5. BROWN SWISS COW, "Brienzi," No. 168.

6. GUERNSEY BULL, Modern type.

WILD CATTLE



1. YAK (*Bos grunniens*).
 2. CHILLINGHAM WHITE BULL.
 3. HEAD OF HIGHLAND BULL.

4. BANTENG (*Bos sondaicus*).
 5. GAUR (*Bos gaurus*).
 6. GAYAL (*Bos frontalis*).

fessor of psychology at Columbia. He became editor of *Science*, *The Popular Science Monthly*, *American Men of Science* (1906; 2d ed., 1910), and *The American Naturalist*.

CATTELL, WILLIAM CASSIDY (1827-98). An American Presbyterian divine and educator. He was born at Salem, N. J., Aug. 30, 1827; graduated at Princeton College (1848) and at the theological seminary (1852); was professor of Latin and Greek in Lafayette College, Pa., 1855-60, and president from 1863 to 1883. His presidency evinced executive ability of a high order. He was secretary of the Board of Ministerial Relief of the Presbyterian Church from 1883 until his death, in Philadelphia, Feb. 11, 1898.

CATTERMOLE, GEORGE (1800-68). An English painter in water color. He was born at Dickleborough, Norfolk, and studied in London under the architectural draftsman, John Britton. His fame rests chiefly on the 100 or more historical and genre pictures, landscapes, and portraits which he exhibited at the Society for Painters in Water Color from 1822 to 1850. Many of these, as "The Diet at Spire," his masterpiece, "Grace in the Refectory," "The Monk's Library" are in the Victoria and Albert Museum. Others are in the National Gallery, in Glasgow, Edinburgh, Dublin, etc. He also furnished illustrations for Scott's novels and poems, several of Dickens's novels, the *Historical Annual*, with text by his brother Richard, and for other works. Cattermole is one of the most important representatives of the Romantic movement in English art. His aquarelles show refined, artistic taste, a gift of color, original and dramatic conception, and spirited execution. Among his intimate friends were Dickens, Thackeray, Landseer, and Browning.

CAT THYME, tim. See GERMANDER.

CATTI, or **CHATTI**, kät'i. A German people who inhabited a country included in the present Hesse and the Prussian Province of Hesse-Nassau. The southwestern part of their territory, around Mattiacum, was conquered by the Romans under Drusus. The Catti took part in the general rising of the Germans under Arminius. Tacitus praises them as excellent foot soldiers. During the reign of Marcus Aurelius they made incursions into Roman Germany and Rhetia. Caracalla failed in an expedition against them and the Alemanni. About the middle of that century their name began to give place to that of the Franks, and is last mentioned by Claudian in the latter part of the fourth century. See SUEVI.

CATTLE (OF. *catel*, from ML. *capitale*, *capitale*, goods, property, from Lat. *capitalis*, important, relating to the head, from *caput*, head). The term "cattle" is usually applied to domesticated bovine animals, principally of two species, *Bos taurus*, European cattle, and *Bos indicus*, the humped cattle of India and Africa, commonly called the zebu (q.v.). The older writers in England used "cattle" or "cattell" as a collective name for all kinds of live animals held as property or reared to serve for food or beasts of burden, including horses, sheep, swine, and by some writers even bees and poultry. Bovine animals were then designated as "horned cattle," and at later periods as "black cattle" and "neat cattle." "Black cattle" was probably first applied to the black breeds of Scotland and Wales. Later it had a more general application. "Neat cattle" were so called because they were useful, "neat" being

derived from the Anglo-Saxon word *neotan* ('to make use of'). The word "cattle" is another form of the words "chattel" and "capital," meaning property, cattle among many primitive peoples being the most valuable goods, and frequently the measure of value of other kinds of property. The old English equivalent for cattle is "kine" or "kyan," derived from *cy*, the plural of *cu*, Anglo-Saxon for "cow." The term "ox" is often used for cattle in general, but in a restricted sense it signifies mature castrated male cattle used for draft purposes, though in continental Europe the term has sometimes been applied to a male not castrated.

Cattle were among the first animals domesticated by man in the early period of the world's history, and have been the most valuable and necessary to his highest welfare in all ages and stages of civilization since that time. It was formerly thought that European breeds of cattle were domesticated from a wild form (*Bos primigenius*) which roamed over Europe and a large part of Asia in prehistoric times. But the oldest forms of domesticated cattle appear to be of a different type (*Bos longifrons*), and it is still an open question as to whether *longifrons* is a domesticated form of *primigenius* or a distinct species which originated in Asia and was taken to Europe during the great Aryan migration. Variations evidently began at an early period, although no very high degree of development was effected by the ancients. Within the last two centuries especially, much attention has been paid to selecting and breeding cattle adapted to special conditions and purposes and to developing the beef and milk producing qualities. It is stated that there are now in various parts of the world over 300 distinct breeds of cattle. The principal and most valuable breeds of America have been derived from Great Britain and other portions of northwestern Europe. The most important results of man's agency in improving cattle by breeding, care, and management have been a tendency of the animals to mature at an earlier age, and readily to lay on flesh and fat, and an increase of the milk production far beyond the needs of the calf, and prolongation of the natural period of milk flow. At present the various recognized breeds of domestic cattle may be classified as beef cattle and dairy cattle. Breeds that are good for both beef and milk productions are often referred to as "dual-purpose cattle."

The cattle industry has assumed very large proportions in the United States. At the close of 1913 there were estimated to be 20,497,000 milch cows worth \$922,783,000, and 36,030,000 other cattle valued at \$949,645,000. Only a small proportion of these were pure-bred registered stock.

Beef Cattle. The principal breeds of beef cattle in Great Britain and the United States are the Shorthorn, Hereford, Galloway, Devon, Polled Durham, and Aberdeen-Angus. These breeds all originated in Great Britain and for the most part took their names from the county or district whence they came. The cattle which have been most famous as a breed in England and America, which have received the longest and closest attention of breeders and improvers, are the Shorthorns or Durhams. The name *Shorthorns* was probably given to distinguish them from the rival race of Bakewell's Longhorns, which they soon surpassed. They are red and white cattle (the colors being variously blended and often roan), are rectangular in out-

line, and have horns of moderate length. They are notable for early maturity, beauty of form, quick-fattening qualities, and minimum amount of waste in slaughtering. Although excellent beef cattle, many of the cows are good milkers, and the breed is considered the best of all for the dual purpose of producing meat and milk. The *Herefords*, originated in the county of Hereford, are red with white on face, chest, belly, feet, and over the tops of the shoulders. They are close rivals of Shorthorns as beef cattle, but are inferior dairy cattle, many giving scarcely enough milk to raise a calf. The *Galloways* are jet-black and hornless, strongly built and rather low in stature. They are hardy in constitution and much esteemed for beef, but very poor dairy cattle. The *Aberdeen-Angus* are also hornless and black, and bear a general resemblance to the Galloways, but mature earlier and are superior as beef animals. For a number of years animals of this breed have won the grand championship at the International Stock Show held at Chicago. The *Devons* are an exceedingly symmetrical, beautiful race, originated in North and South Devonshire. They are of a rich red color, and although the bulls and cows are rather small, the oxen grow to great size. The Devon oxen have long been prized as work animals. There are good examples of the beef and dairy types in this breed. The *Polled Durham* breed originated in the United States by the selection of "sports" which occurred in the Shorthorn breed. As to size, form, color, and general appearance they resemble the typical Shorthorn beef form without the horns. The native cattle of the Southwest, known as the "Texas steer," was originally from Spanish stock imported during Colonial times. This type is fast disappearing because of the introduction of better breeds. The beef animal has been specifically designed for the most favorable production of the best cuts, and while there are many cows which combine milk and beef production to a profitable degree, a good carcass of beef from a steer of a pronounced dairy type or breed is rarely seen. The beef type of animals is rectangular in outline, low, broad, deep, smooth, and even—no wedge-shape or sharp protruding spinal column is wanted for the block. Broad, well-covered backs and ribs are absolutely necessary to a good carcass of beef, and no other excellences will compensate for the lack of this essential. It is necessary both to breed and feed for thickness in these parts. Animals that are soft and patchy, or hard and rolled on the back, are sure to give defective and objectionable carcasses, even though they are thick, and they also cut up with correspondingly greater waste. A marked and important change has taken place in the profitable type of cattle within comparatively recent years. The present demand is for quality and finish rather than size. The modern type makes beef at decidedly more profit and economy to both the producer and the butcher, and furnishes the consumer a far superior article.

Dairy Cattle. In no line of improvement of live stock have more remarkable results been attained than in the case of the dairy cow. This improvement has taken place in the earliness of maturity, the length of the milking period, the quantity and richness of the milk produced and the general economy of production. In the modern dairy cow the tendency to lay on flesh, so highly developed in beef animals, has been largely eliminated, and in its place the ability to

convert economically the food eaten into milk has been cultivated in a high degree. Continued breeding to a special purpose and better methods of feeding have changed the former short milking period, limited almost to the pasture season, to a comparatively even flow of milk during 10 or 11 months of every year. A cow that does not average six or seven quarts of milk a day for 300 days in the year, aggregating 4000 pounds, is not considered very profitable. There are many herds having an average yearly production of 5000 pounds per cow, and single animals are numerous which give 10 or 12 times their own weight in milk during a year. Quality has been so improved that the milk of many a cow will make as much butter in a week as did that of three or four average cows of the middle of the last century.

The points observed in judging dairy cows are shown in the accompanying illustration, taken from a publication of the United States Department of Agriculture:

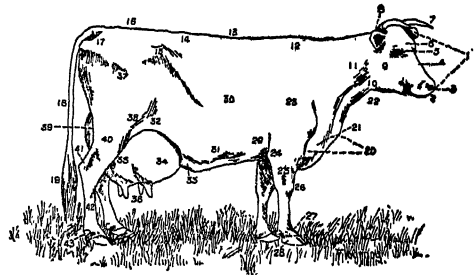


DIAGRAM OF COW SHOWING POINTS.

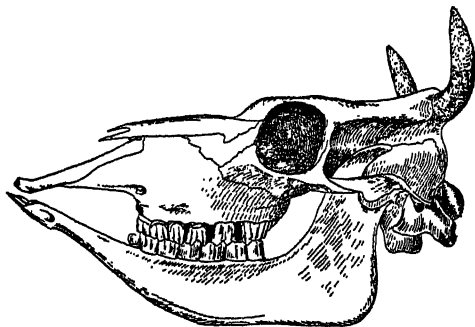
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|--------------|------------------|---------------------|--------------------|
| 1. Head. | 12. Withers. | 23. Shoulder. | 34. Fore udder. |
| 2. Muzzle. | 13. Back. | 24. Elbow. | 35. Hind udder. |
| 3. Nostril. | 14. Loin. | 25. Forearm. | 36. Teats. |
| 4. Face. | 15. Hip bone. | 26. Knee. | 37. Upper thigh. |
| 5. Eye. | 16. Pelvic arch. | 27. Ankle. | 38. Side. |
| 6. Forehead. | 17. Rump. | 28. Hoof. | 39. Twist. |
| 7. Horn. | 18. Tail. | 29. Heart girth. | 40. Leg or gaskin. |
| 8. Ear. | 19. Switch. | 30. Side or barrel. | 41. Hook. |
| 9. Cheek. | 20. Chest. | 31. Belly. | 42. Shank. |
| 10. Throat. | 21. Brisket. | 32. Flank. | 43. Dew claw. |
| 11. Neck. | 22. Dewlap. | 33. Milk vein. | |

Different scales of points have been adopted by the various breeders' associations.

The breeds of dairy cattle most common in the United States and England at the present time are Ayrshire, Holstein, Guernsey, Jersey, Red Poll, French Canadian, Dutch Belted, Brown Swiss, and Shorthorns. The *Ayrshires*, named for the county of that name in the southwest of Scotland, are medium-sized cows, short-legged, fine-boned, and very active. The general form is the wedge shape, regarded as typical of cows of dairy excellence, and good specimens are thin when in milk. The prevailing color is red and white, in spots variously proportioned, but not mixed. The cows are large and persistent milkers, but the fat globules are small, which causes the cream to rise slowly. An average yield of 5500 pounds of milk a year per cow for a working herd is often realized. One noted herd has an average for 19 years of over 6400 pounds per cow, and individuals produce over 15,000 pounds a year. Butter records are not numerous, but herds average 300 to 400 pounds a year, and there are individual records of as high as 900 pounds.

The *Jersey* and *Guernsey* breeds were both originated in the Channel Islands, but in the development of the latter more of the characteristics of the parent stock of Normandy have been retained. They were both formerly called Alderneys. The *Guernseys* are rather larger than the *Jerseys*, strong-boned, and are claimed to be hardier. They are light in color,

with darker shades approaching brown, and have a yellow skin. The milk of both breeds is unusually rich in fat, the fat globules being large and separating readily in creaming. The Guernseys are liberal milkers. At home the average cow is expected to produce 5000 pounds of milk and 300 pounds of butter a year without high feeding. In the United States they are usually fed higher and respond accordingly. There are records of several herds which have averaged over 6000 pounds of milk and 350 pounds of butter a year. Individual cows have produced over 18,000 pounds of milk and 1000 pounds of butter a year. The *Jerseys* are the smallest of the better dairy breeds, though in the United States they have been considerably



SKULL AND TEETH OF THE COW.

Dentition of a young Jersey cow, showing the small incisors and canines crowded in the extremity of the lower jaw (none in the upper jaw), and the great grinders (molars and premolars).

increased in size. The color varies from cream to various shades of fawn, tan, and mouse color, dark brown and even black. They have beautiful heads, with intelligent faces, and rather small, close horns. The body is well rounded, and the udder is of good size, with highly developed milk veins. They are irregular in outline and thin in flesh. Like the Guernseys, they are not large, but are persistent milkers, and their milk is the richest of all breeds. For many years they have been bred especially for butter production, although American breeders have striven with considerable success to increase the milk yield without diminishing the quality. Good herds produce from 3500 to 4500 pounds of milk a year, and several herd records show averages of 6000 and 7000 pounds per cow. Single cows produce over 1000 pounds of butter a year, and there are numerous records of 25 to 30 pounds of butter a week. Jerseys are heavy feeders, and as a rule will bear high feeding and forcing for long periods unusually well. Brown Bessie, the famous champion butter cow of the Chicago World's Fair dairy test, averaged over 40 pounds of milk a day for five months, and made 3 pounds of butter a day several times. The *Holsteins*, or *Holstein-Friesians*, of north Holland

and Friesland, are black and white, irregularly marked, but not mixed, large in frame, strong, and usually in good flesh. The udder is often of extraordinary size in conformity with the reputation of the breed for enormous milk production. It is not unusual for a cow to give more than her own weight in milk every month for 10 or 12 consecutive months, and there are numerous instances of yields of 100 pounds or more a day, and 20,000 to 30,000 pounds a year, although 40 to 60 pounds a day, or 7500 to 8000 pounds a year, is considered an average. But the milk is usually poorer in fat than that of some breeds. The fat globules are quite small, and the cream does not rise readily on setting. There are some families of Holsteins, however, which give milk of fully average richness and are profitable butter producers.

The *Red Polls* are a comparatively new breed, resembling the Devons, but are hornless. They are only fair dairy cattle, being in the class of breeds which aim to serve the dual purpose of milk and beef production. The *Shorthorns*, described above as beef cattle, include many individuals notable for milk production. In the best milking strains the cows are rather more angular in outline than the beef types and have large, hairy udders. The *Shorthorns* made a surprisingly good showing in the World's Fair breed test (1893), and records of several herds in the United States show a milking period of 275 days and an average production of 6500 pounds of milk.

French Canadians are a breed developed in Canada from native stock, most of which came originally from France. They resemble the Jerseys in type and are very hardy. The *Brown Swiss*, which originated in Switzerland, also resemble the Jerseys in color, but are much coarser than most dairy breeds. Many of them, however, are excellent milkers. The *Dutch Belted* are a small type of Holsteins with a broad white band about the middle of the body, the remainder of the animal being black in color. Cattle of several other European breeds have been brought to the United States, but not in sufficient numbers to be of any significance to the cattle industry. Recently zebu from India to be used in crossing with breeds in Texas because of their resistance to tick fever have been introduced.

Formerly certain dairy breeds were considered especially adapted to cheese making, and others to butter making, and the two qualities were supposed to be to a certain extent incompatible. The agricultural experiment stations have shown, however, that this is not the case, but that the value of milk for cheese-making as well as for butter making is measured by its fat content. The richness of the milk in fat is to some extent a breed characteristic, although within the breed the variations in this respect are quite wide in the case of different cows. The following averages of a large number of analyses of milk from cows of different breeds are something of an indication of the composition:

COMPOSITION OF MILK OF DIFFERENT BREEDS

BREED	Water	Total solids	Fat	Casein and albumin	Milk sugar	Ash
	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
Ayrshire.....	86.93	13.07	3.58	3.42	5.43	0.64
Holstein.....	87.62	12.38	3.46	3.39	4.84	0.74
Guernsey.....	85.39	14.61	5.12	3.61	5.11	0.75
Jersey.....	84.60	15.40	5.61	3.91	5.15	0.74
Shorthorn.....	87.20	12.80	3.47	3.21	5.43	0.69

Attempts to determine by experiment which is the best dairy breed have not been entirely satisfactory or convincing, on account of the large number of factors which have to be taken into account in determining this, aside from the yield and composition of the milk, such as hardness, constitution, adaptability to given conditions, feed requirements and economy, ultimate value for beef, etc.

In the Chicago World's Fair breed test, although open to all, only the Guernsey, Jersey, and Shorthorn breeders' associations entered the competition, and they selected the best cows of their respective breeds to be found. The results of the butter and cheese tests with these three breeds are summarized as follows:

WORLD'S FAIR BREED TESTS, 1893

NO. 1, CHEESE TEST, 15 DAYS, MAY

COWS IN TEST	Milk produced	Fat in milk	Cheese made	Price of cheese per pound	Cost of feed	Net gain
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Cents</i>	<i>Dollars</i>	<i>Dollars</i>
25 Jerseys	13,296.4	601.91	1451.8	13.36	98.14	119.82
25 Guernseys	10,938.6	488.42	1130.6	11.95	76.25	88.30
25 Shorthorns	12,186.9	436.60	1077.6	13.00	99.36	81.36

NO. 2, 90-DAY BUTTER TEST, JUNE, JULY, AUGUST

COWS IN TEST	Milk produced	Fat in milk	Butter credited	Proceeds of butter	Cost of feed	Net gain
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
25 Jerseys	73,488.8	3,516.08	4,274.01	1,747.37	587.50	1,323.81
25 Guernseys	61,781.7	2,784.56	3,360.43	1,355.44	439.14	997.64
24 Shorthorns	66,263.2	2,409.97	2,890.87	1,171.77	501.79	910.12

The breed test at the Pan-American Exposition held at Buffalo in 1900 lasted six months. The results are summarized in the following table:

RECORD OF 5 COWS EACH OF 10 BREEDS FOR 6 MONTHS, SHOWING TOTAL PRODUCTION, COST OF FOOD, AND NET PROFIT BY BREEDS

BREED	Yield of milk	Yield of fat	Yield of solids	Cost of feed	Profit in butter	Profit in solids
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
Jersey	26,986.3	1,223.88	3,770.08	137.77	225.41	200.63
Guernsey	27,134.5	1,248.09	3,754.99	136.99	230.11	202.56
Ayrshire	32,998.2	1,219.44	4,185.32	140.74	217.91	235.87
Shorthorn	31,988.2	1,129.77	4,086.59	162.08	171.82	205.64
Holstein	39,059.9	1,275.85	4,760.87	164.57	210.62	262.15
Polled Jersey	20,326.6	948.31	2,831.73	109.62	169.24	145.18
French Canadian	24,615.2	984.11	3,277.36	113.11	176.45	181.83
Brown Swiss	30,890.3	1,123.15	3,943.03	147.30	182.99	207.51
Red Polled	28,713.0	1,141.81	3,773.73	138.15	198.15	201.15
Dutch Belted	24,893.3	847.50	3,066.50	132.48	116.79	132.00

The various breeds continue to have their advocates and admirers, and each breed has some points of advantage. The pure-bred stock, however, comprise only a very small fraction of the dairy cows of the United States and Canada. The larger part of the cows are *grades*, i.e., crosses of natives or ordinary cows with pure breeds. Among these are many excellent animals, rivaling the thoroughbreds in amount and economy of milk production. Much attention is now being given by dairymen to testing the individual cows of their herds, determining which are the most profitable ones, and gradually eliminating the inferior ones. In this way an improvement of the ordinary stock is going on which in some sections has already raised the cows to a high degree of excellence and will ultimately result in a much higher standard for good dairy cows.

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Breeds of Beef Cattle," *Bulletin 34, Bureau of Animal Industry* (Washington, 1902); Shaw, *Management and Feeding of Cattle* (New York, 1909); Fream, *Complete Grazier* (London, 1900); Werner, *Rinderzucht* (Berlin, 1912); Wilson, *Evolution of British Cattle* (Edinburgh, 1910); "Cattle and Dairy Farming," 2 vols. in *Consular Reports* (Washington, 1887); C. H. Eckles, *Dairy Cattle and Milk-Production* (New York, 1911). See also FEEDING FARM ANIMALS; DAIRYING; BREEDS AND BREEDING; UNITED STATES, *Cattle*; Plate of WILD CATTLE.

CATTLE, CHILLINGHAM. A breed of the so-called wild cattle of Great Britain (*Bos taurus*, var. *scoticus*), preserved in Chillingham Park, Northumberland, England. This park, the property of the Earl of Tankerville, is a remnant of one of the great forests of Great Britain. It was formerly believed that these cattle and other herds which are found at Cadzow, near Chillingham, at Chartley (Staffordshire), Som-

erford and Lyme (Cheshire), and Kilmory (Argyllshire), were descended from the urus (q.v.) without contact with any domesticated breed, but it is now generally believed that they are descendants of domesticated animals which have become feral. The Chillingham cattle, which approach most nearly to the true *primigenius* type, number about 60, and are described as of medium size, compact in body, and dingy white in color, with black-tipped horns, brownish muzzle, and red ears. They are timorous, unless hard-pressed, and feed by night. The cows conceal the calves under tall ferns and undergrowth and resist all approach to them. It is said that these cattle refuse to mingle with any other. This prevents degeneracy of breed, and the accepted characteristics are also maintained by destroying any calf that shows deviations of color. For illustration, see Plate of WILD CATTLE.

CATTLE GUARDS. See RAILWAYS.

CATTLE PLAGUE, RINDERPEST (Ger.), or STEPPE MURRAIN (Fr. *peste bovine*). An acute febrile contagious disease of cattle, sheep, goats, camels, the wild ruminants, and occasionally swine caused by an ultramicroscopic organism. The disease is characterized by its short period of incubation, sudden appearance of high temperature, a croupous diphtheritic inflammation of the mucous membranes, and the high rate of mortality. Horses, carnivora, and man are immune to the disease. It occurs indigenously on the plains of western Russia and throughout Asia, whence it has at various times overspread most parts of the Old World. The disease runs a tolerably fixed and definite course, which is not materially altered by any known remedial measures. It seldom attacks the same individual a second time.

History. Cattle plague has been recognized for upward of 1000 years. It appears to have destroyed the herds of the warlike tribes that overran the Roman Empire during the fourth and fifth centuries. About 810 it traveled with the armies of Charlemagne into France, and about the same period is also supposed to have visited England. Several times throughout the course of every century it spread from the plains of Russia over the western countries of Europe, and is stated to have visited England again about 1225. Although causing every few years great losses on the continent of Europe, the plague does not appear to have shown itself again in England until 1714, when it appeared at Islington, about the middle of July, and was very destructive for about three months, but was got rid of towards the end of the year. In 1744 it was in Holland, destroying there in two years 200,000 cattle; in Denmark, from 1745 to 1749, it killed 280,000; in some provinces of Sweden it spared only 2 per cent of the horned cattle. It made terrible havoc throughout Italy, destroying 400,000 animals in Piedmont alone. In April, 1745, the plague was again imported into England, probably by some white calves from Holland. It continued its devastation for 12 years, but it is now impossible accurately to determine the losses it occasioned. In the third and fourth years of its ravages, 80,000 cattle were slaughtered, and double that number are supposed to have died. In 1747, 40,000 cattle died in Nottingham and Lancashire alone; while so late as 1757, 30,000 perished in Cheshire in six months. In March, 1770, the disease was brought with some hay from Holland to Portsoy, in the Moray Firth;

several cattle died, and others to the value of about £800 being destroyed, the further spread of the pest was prevented. By the wars which wasted Europe towards the close of the eighteenth and in the first eighteen years of the nineteenth century, cattle plague was spread widely over the Continent, and occasioned, wherever it occurred, terrible losses. Since then, at short intervals, it has spread—always being traceable to its source on the Russian plains—over Poland, Hungary, Austria, Prussia, portions of Germany, and Italy, and has extended to Egypt. The following are the records of its destructive career during this outbreak:

	Attacked	Killed	Died	Recovered
England.....	223,672	102,740	90,450	21,589
Wales.....	8,388	1,180	5,794	1,117
Scotland.....	40,863	6,263	28,088	10,707
Total.....	278,923	110,183	124,332	33,413

To this total must be added 11,000 cases known to have been attacked and unaccounted for, and upward of 60,000 healthy cattle slaughtered to prevent the spread of the disease. Plague was again imported into Hull in 1872 with cattle from Cronstadt; it spread into several districts of the East Riding, attacked 72 animals, 51 of which were killed and 21 died. The last outbreak in England occurred in 1877, resulting in the loss of 1198 animals. The most extensive losses, however, have occurred on the steppes of Russia, and in Turkestan, Persia, China, Japan, Java, Egypt, and South Africa. In Africa the disease spread south from Egypt along the Nile during the Italian invasion in 1890 and within five years reached the South African States and the West African Colonies of Germany. In Cape Colony alone 1,300,000 animals died of the disease in the year 1897-98. During recent years it has been considerably limited by the persistent employment of protective vaccination. In the Philippines it is the most important disease, attacking common cattle, Indian cattle, and carabao. In 1902, 629,176 cattle and carabao died, principally of this disease; during the year 1911-12, 4312 new cases were reported with 2847 deaths. The disease has never yet invaded the Western Hemisphere nor Australia.

Cause. The disease has been shown to be caused by a virus that will pass through the finest porcelain filters, and thus belongs to the group of ultramicroscopic microorganisms. This virus occurs abundantly in the blood of every plague-stricken beast, in the discharge from its nostrils, mouth, or eyes, in the urine, in the excrement, probably even in the breath. It may be transferred to healthy beasts by inoculation. A little of the blood or nasal or other mucous discharges of a plague case, if introduced underneath the skin of a healthy cow, develops the disease within a few days. The transference of the virus or contagion from the sick to the sound animal is not always so direct and evident. As with other contagious diseases, the virus may be conveyed by insects; it may adhere to the food that has lain before infected beasts or may gain entrance in the drinking water; it may adhere to the litter from the stalls, even after it has been heaped for weeks; to the clothes of attendants; to the floors, walls, or stalling of buildings; or to imperfectly cleansed

cattle cars. It usually gains access to the blood through the digestive tract, perhaps also by absorption through the skin.

Symptoms. In from three to nine days after an animal has been exposed to the virus of cattle plague, or from 36 to 48 hours after being purposely inoculated, the temperature of the body is raised several degrees. A delicate thermometer introduced into the vagina or rectum, instead of marking about 101° F., indicates 104° to 106°. Two or three days later a striking dullness is manifested, and the animal becomes indifferent to surroundings. The pupils of the eyes are contracted, and the animal may be in a state of vertigo or coma. Within 12 to 24 hours the milk secretion is diminished by one-half or two-thirds, the mucous membrane of the mouth is generally observed to be slightly reddened, and soon a granular, yellowish-white eruption, consisting of thickened epithelium cells and granules, appears on the gums round the incisor teeth, and by and by on the lips and dental pad. Some hours later the same eruption extends to the cheeks, tongue, and hard palate. Within 48 hours a crust of epithelium covers the gums, lips, and mouth, and then, wiped away or accidentally rubbed off, leaves the abraded membrane red and vascular and exhibiting patches of erosion. The membrane lining the vagina indicates very similar appearances; it is reddened and vascular, dotted with grayish, translucent elevations about the size of rapeseeds, covered with a whitish-yellow, usually sticky discharge, and occasionally marked with patches of excoriation. The skin is dry; there is hence a perverted development of scarfskin, and of the oleaginous secretion of the irritated sebaceous glands. The skin is thus invested with yellowish scales; while on its thinner portions—about the lips, between the thighs, and on the udder—there are papular eruptions or elevations. The animal hangs its head, arches its back, the eyes are leaden and watery, and from both eyes and nose there latterly comes a dirty, slimy discharge. Appetite and rumination are irregular. The breathing is oppressed; expiration is prolonged and accompanied by a peculiar grunt. The pulse is small and thready, and is quickened as death approaches. The bowels, usually confined at first, become, toward the sixth or seventh day, much relaxed; the discharges passed, often with pain and straining, are profuse and liquid, offensive, acrid, pale-colored, and occasionally mixed with blood. The patient loses weight and strength, totters if it attempts to walk, and prefers to lie rather than to stand. Death usually occurs within from two to seven days, and is preceded by muscular twitchings, a peculiar, offensive smell, a cold, clammy state of body, moaning, grinding of the teeth, and rapidly increasing prostration.

Diagnosis. The sudden appearance and rapid development of the symptoms, among which the characteristic affection of the mucous membranes is of great importance, aid in the recognition of the disease. The diseases to be differentiated are coccidiosis, or red scour, malignant catarrhal fever, foot-and-mouth disease, and piroplasmosis.

Prognosis. Cases usually terminate unfavorably when the animal's temperature falls rapidly; the pulse becomes small, quick, and weak; the breathing more difficult, distressed, and moaning; the diarrhœa increased, and the depression more notable. A more favorable termi-

nation may be anticipated when, after the fifth day, the heightened temperature, so notable even from the earliest stages, abates gradually; the breathing becomes easier, the pulse firmer, the visible mucous membranes appear healthier, and patches of extravasation or erosion speedily disappear.

Sheep do not take rinderpest spontaneously, and even when kept with diseased cattle, or inoculated with cattle-plague virus, they do not catch the disease so certainly as do cattle. When diseased, they exhibit, however, very similar symptoms; but Professor Röhl and other observers record that about 55 per cent resist artificial infection. The mortality in sheep and goats rarely exceeds 25-30 per cent. Goats, deer, carabao, gazelles, yaks, and, indeed, all animals affected with rinderpest, exhibit with tolerable uniformity the same characteristic symptoms.

Post-mortem Appearances. The mucous membranes are generally deeper-colored than natural, are congested, softened, marked in places with the same granular patches discoverable during life within the mouth of the vagina, and in bad cases exhibit œdema, hemorrhage, and sloughing. The first three stomachs sometimes contain a good deal of food, but show less declension from health than does the fourth stomach, the mucous membrane of which is dotted with spots of congestion and extravasation. The coats of the bowels are thinned and easily torn. The mucous coat, especially towards the middle of the small intestine, the opening into the cæcum and posterior half of the rectum, is much congested, bared of epithelium, and sometimes marked with blood spots, but never ulcerated. Peyer's glands, so generally inflamed in the somewhat analogous typhoid fever of man, are perfectly healthy. The liver is yellow, and the gall bladder contains an abundance of fluid. The respiratory mucous membrane, like the digestive, is vascular, and marked with submucous hemorrhage; the lungs are generally emphysematous, the heart often marked with blood spots. The urinogenital, like the other mucous membranes, is congested in females, especially toward the lower part of the vagina and vulva; the kidneys are enlarged and hemorrhagic in the cortical zone; the serous membranes and nervous centres are perfectly unchanged. As in other septicæmic diseases, a considerable increase in the number of white blood corpuscles is observed. The blood itself is dark in color; in the later stages it contains less water, probably owing to the draining diarrhœa, and about double its usual proportion of fibrin. The muscular tissues are softened, easily broken down, and contain an abnormal amount of soluble albumen. The urine is little altered in quantity, but from the first rise in the animal's temperature it contains an increase of urea varying from 5 to 15 per cent. The chief change in the milk is its rapid diminution in quantity and the increase of its fatty matters. The bile is watery, offensive, and prone to decomposition.

Treatment. In countries where the disease is not endemic treatment is prohibited by law, owing to the fact that all therapeutic measures are without avail and to the serious danger of extensive outbreaks occurring. In countries where treatment is not prohibited all affected animals should be given large quantities of anti-rinderpest serum intravenously and stimulants by mouth. All animals in contact should be in-

jected subcutaneously with serum and allowed to mix with the diseased animals in order that they may contract a mild form and obtain an active immunity.

Prevention. Prophylactic measures consist in (1) exclusion and (2) extinction. The former is brought about by prohibiting the importation of susceptible animals or products thereof, unless properly disinfected, from countries where the disease is known to occur into a country that is free from the disease. Extinction may be brought about by the destruction of all affected and exposed animals, followed by a thorough disinfection of the surroundings and a precautionary quarantine of the district.

Protective Inoculation. The earlier attempts to immunize against this disease date from the middle of the eighteenth century, when the secretions of affected animals—the nasal discharges or lachrymal secretions—were introduced under the skin. This practice was given up on account of the severe affection and the large losses resulting. The principal methods of vaccination are (1) Koch's fresh bile method, (2) the glycerinated bile method, (3) the serum-alone method, and (4) Kolle and Turner's serum-simultaneous method. The first method consists in the taking of blood-free bile of affected animals from the sixth to the eighth day of the disease and injecting non-immune animals therewith. This results in the establishment of an immunity after 10 days. The several drawbacks to this method are that the immunity lasts for but a few months, that a large quantity of bile is required to inoculate large herds, and that a large number of fatalities have at times resulted. The second method is a modification of the first in that one-half the quantity of glycerine is added to the bile and kept for eight days. From 20 to 50 cubic centimeters of the glycerinated bile is injected, followed about two weeks later by a small dose of virulent blood. This results in an active immunity becoming established after 14 to 16 days, which lasts for a long time. The third, or serum-alone, method consists in the injection of a protective dose of antirinderpest serum. Such an immunity, a passive immunity, lasts two to six weeks, but increased doses may extend it for a longer period. This method is made use of to confer a temporary immunity upon stock to tide them through an outbreak or to safeguard them when traveling through infected districts. The fourth, or serum-simultaneous, method consists in the injection of antirinderpest serum on one side and virulent blood on the other. A mild form of the disease results, and a lasting immunity is established after 14 to 16 days.

In localities where piropilosis and trypanosomiasis are prevalent there is danger that these diseases may be transmitted with the blood from cattle affected with rinderpest, and this must be guarded against.

Consult: Dieckerhoff, *History of Rinderpest and its Literature* (Berlin, 1890); Hutyrá and Marek, *Pathology and Therapeutics of the Diseases of Domestic Animals*, vol. i (Chicago, 1912); Hoare, *A System of Veterinary Medicine*, vol. i (Chicago, 1913).

CATTLE TICK. See TEXAS FEVER.

CATTY (Malay, Javanese *kāti*, *kati*, pound). The unit of weight largely used throughout Chinese and Malayan Asia, and by the Chinese all over the world. A catty equals $1\frac{1}{3}$ pounds avoirdupois, or 625 grams.

CAT'TYWAR'. See KATHIAWAR.

CATULLUS, GAIUS VALERIUS (c.87-c.54 B.C.). The greatest of the Roman lyric poets. He was born in Verona, of a respected and well-to-do family. He settled in Rome in early life, and was on terms of familiarity with the leading men of the day—Cicero among them—though he was himself in rather moderate circumstances. In Rome he formed a passionate attachment for a woman whom he celebrates under the name of "Lesbia." There is little doubt that she was Clodia, the sister of Cicero's enemy, P. Clodius Pulcher. This was the consuming passion of his life, and the theme of many of his finest lyrics, in which we have the throbbing life of an emotional yet not quite mature genius. In them we read the story of his earlier hopes and joys, then his jealousy, his quarrels and reconciliations, and at last his despair when he fully came to recognize the open infidelity of the woman whom he loved. Catullus is intensely personal in his poetry and utterly without reserve; many of his shorter poems breathe the deepest affection for his friends, with the most stinging invective for his enemies. His longer poems are largely based on Alexandrian Greek models. The most notable are the two *epithalamia*, or marriage songs (61, 62), the *Epyllion*, entitled the *Nuptials of Peleus and Thetis* (64), and the weird, imaginative poem *Attis*, in strange Galliambic verse (63). The *Attis* has no parallel in Roman literature, and its spirit shows a subtle Oriental influence. (For its story see *ATTIS*.) Catullus was a master of poetic diction, and the most original of the Roman poets, if we except Lucretius. His shorter verse, however, is often marred by gross sensuality and even frank obscenity.

The best editions of Catullus are those by Böhrens (Leipzig, 1885), R. Ellis (Oxford, 1889), E. T. Merrill (Boston, 1893), and Friedrich (Leipzig, 1908). He has been often translated into English—by Lamb (1821), Martin (1861), Cranstoun (1867), Ellis (1871), Hart Davies (1879), Grant Allen (the *Attis* only, 1892), Cornish (1912).

CATULLUS. The name of several distinguished Romans. 1. GAIUS LUTATIUS CATULLUS, the admiral whose fleet defeated the Carthaginians near the Ægates Insulæ, off the Sicilian coast, in 241 B.C., thus closing the First Punic War. 2. QUINTUS LUTATIUS CATULLUS, consul with Marius in 102 B.C., when he was unsuccessful in checking the advance of the Cimbri (q.v.) to the Po. In 101, with Marius, he defeated them in a great battle on the Raudian Fields. In the proscription of Sulla (87 B.C.) his name was included; but he preferred suicide and suffocated himself with charcoal fumes. He was an excellent orator. 3. QUINTUS LUTATIUS CATULLUS, son of the preceding, consul in 78 B.C., censor in 65. He quelled the revolutionary uprising of M. Æmilius Lepidus, his colleague in the consulship (78), who had tried to overthrow Sulla's constitution, and assisted Cicero in the prosecution of Catiline.

CAUCA, kou'ká. A river of Colombia, South America, the chief tributary of the Magdalena (Map: Colombia, B 2). It rises in the southern portion of the Central Cordillera and flows in a northerly direction between the Western and the Central Cordilleras, forming numerous waterfalls, but becoming navigable at Antioquia. It joins the Magdalena north of Mompos, about 150 miles from the sea, after a course of nearly 700 miles.

CAUCA. A department of Colombia, embracing the west coast of the Republic, the three chains of the Andes, and the valley of the Río Cauca, as well as a large part of the interior (Map; Colombia, B 3). Its original area was 31,388 square miles, but in 1905 was reduced to 20,403 square miles. It is divided by the Andes into two parts, of which the western is alone developed. The territory of Caquetá, which occupies by far the larger portion of the department, belongs to the basin of the Amazon and is almost uninhabited. The formation of the surface and the climatic conditions of Cauca present an extraordinary variety, ranging from the lofty, snow-clad peaks of the Andes to the fertile valleys along the rivers. The centre of population and cultivation is along the Cauca valley, where corn, sugar cane, cacao, tobacco, etc., are grown with success. The mineral wealth, especially gold and silver, is extensive. The forests, which cover a large section of the department, yield large quantities of rubber and cinchona. Pop., including aborigines, 1912, 211,756. The capital is Popayan, with a population of 18,724.

CAUCASIA, kə-kā'shī-ā. See CAUCASUS.

CAUCASIAN, kə-kā'shən, or **CAUCASIC**, kə-kās'ik, **RACE**, **THE**. The name applied by Blumenbach (1795) to the white division of mankind, as distinguished from the yellow, the brown, and the black. Whether these divisions be called species, subspecies, varieties, or races, they exist and have separate names. The objection is made to the word that it is not sufficiently connotive, because the peoples of the Caucasus do not fairly represent the grandest division of humanity. But the term is fixed in literature and will doubtless remain. Another controversy is waged over the original area of development and dispersion of the Caucasian race. Within a quarter of a century opinions have shifted from southern Asia to northern Africa. Keane says that the Caucasian progenitor originated in Africa, north of the Sudan, and quotes Sergi as saying that Africa is the cradle land whence this Caucasian family spread northward to Europe, where it still persists, and eastward to western Asia. The whole of northern Africa, connected by land with Europe in the Quaternary epoch, formed part of the geographical area of the ancient white race. The last word has not been said on this point. The cradle land of the human species may have been in southeastern Asia. In that event new difficulties with reference to the formation of the great subspecies arise.

Various classifications of the members of the Caucasian race have been made. Huxley (1870) made two separate races of whites—the Xanthochroid of northern Europe, and the Melanochroid of southern Europe, northern Africa, and Asia. A much later tabulation is that of Deniker, here given:

I. BRUNETTE TYPE: WAVY BROWN OR BLACK HAIR, DARK EYES

Clear brown skin, black hair, narrow, straight, or convex nose, tall stature, dolichocephalic	INDO-AFGHAN.
Tawny skin, { Tall stature, { Aquiline nose, prominent occiput, elliptical face, dolichocephalic	ARAB or SEMITE.
white skin, { long face { Straight coarse nose, square face, dolichocephalic	BERBER (4 subraces).
black hair { Short stature, dolichocephalic { Straight fine nose, oval face, mesocephalic	LITTORAL EUROPEAN.
Dull white skin, { Short stature, round face, strongly brachycephalic	IBERO-INSULAR.
brown hair { Tall stature, elongated face, brachycephalic	WESTERN EUROPEAN.
	ADRIATIC.

II. FAIR TYPE: WAVY OR STRAIGHT HAIR, LIGHT EYES

Reddish { Hair somewhat wavy, reddish; tall stature, dolichocephalic	NORTHERN EUROPEAN.
white skin { Hair somewhat straight, flaxen; short stature, sub-brachycephalic	EASTERN EUROPEAN.

In this table the Littoral European (called also Atlanto-Mediterranean) corresponds with the Iberian of English writers; the Western European, or Cévenole, is the Celtic, or Alpine, of authors; the Adriatic type is the tall, brachycephalic population of the northwest Balkan Peninsula; Northern European corresponds with Teutonic, or Nordic, and Eastern European with White Russian, or Lithuanian.

Compare this scheme with Keane's divisions of the Caucasian peoples: (1) *Homo europæus*.—Scandinavians, North Germans, Dutch, Flemings, most English, Scotch, and Irish; Thrako-Hellenes, some Kurds, most West Persians, Afghans, Dards, and Siah-posh Kafirs; many Hindus. (2) *Homo alpinus*.—Most French and Welsh, South Germans, Swiss, and Tyrolese; Russians, Poles, Czechs, Yugo-Slavs; some Albanians and Rumanians; Armenians, many Kurds, Tajiks (East Persians), Galchas, Indonesians. (3) *Homo mediterraneus*.—Most Iberians, Corsicans, Sards, Sicilians, Italians, Greeks, Berbers, and other Hamites; Arabs and other Semites; some Hindus; Dravidas, Todas, Ainus.

The best modern works on the subject are: Keane, *Ethnology* (Cambridge, 1896); id., *Man: Past and Present* (Cambridge, 1899); Ripley, *Races of Europe* (New York, 1899); Deniker, *Races of Man* (London, 1900); Sergi, *Mediterranean Race* (London, 1901); Giuffrida-Ruggeri, *Homo Sapiens* (Leipzig and Vienna, 1913).

CAUCASUS, kə'ka-sūs (Lat., from Gk. *Kaukasos*, *Kaukasos*, Fr. *Caucase*, Ger. *Kaukasus*, Russ. *Kavkas*). A region occupying the southeast corner of Europe and extending into Asia (Map: Russia, F 6). It extends from about lat. 38° to 46° 30' N., constituting the isthmus separating the Caspian from the Black Sea and the Sea of Azov. Its area is about 180,000 square miles. Russian Armenia is included in the southern part. The famous Apsheron Peninsula, the site of the celebrated Baku oil fields, lies in its southeastern section.

Considered ethnologically and physically, the Caucasus is the most interesting part of the Russian Empire and one of the most interesting countries. The surface presents a wide diversity of aspects, since it comprises a low and marshy region in the north, as well as the snow-clad peaks of the Caucasus Range. This range crosses the territory from northwest to southeast and, with its offshoots, occupies the larger part.

The main range divides the country into northern Caucasia (Ciscaucasia) and Transcaucasia. The former is, in the main, a level country, the prolongation of the Russian plains, having lagoons, marshes, and steppes and peopled mainly by nomad Kalmuks. Its central elevation lies between the head streams of the Kuma and the Terek, which flow into the Caspian, and those of the Kaban, an affluent of the Black

Sea. Transcaucasia, or the region south of the main Caucasus Range, forms a striking contrast to the northern part. It is occupied chiefly by lines of mountains running parallel with the great central range. The river Kur, together with its affluent, the Arax, drains a great part of Transcaucasia, emptying into the Caspian. The much smaller Rion flows into the Black Sea.

The water system of the Caucasus belongs wholly to these two seas. Lakes are found only in Transcaucasia. The chief of them is the Gokcha, or Sevanga, situated in Erivan. Its altitude is above 6000 feet, its area over 500 square miles. For further physiographical details, see CAUCASUS MOUNTAINS.

The varieties of climate effect sharp contrasts in flora and fauna: From the northern pine on the lofty altitudes to the unusually luxuriant growths in the basin of the Rion, where figs, pomegranates, etc., flourish, there is an extraordinary range of vegetation. The fauna ranges from the leopard, and even the tiger, to the common European species of wild animals.

The mineral deposits of the Caucasus are among the richest in Russia, and its oil wells are second only to those of the United States. Despite lack of adequate transportation facilities and want of enterprise and equipment, production has increased and the mining industry has developed. Coal, of inferior quality, is extracted—3,380,000 poods in 1911; 2,400,000 (1910); 3,220,000 (1908); 2,862,000 (1907) (pood = 36,113 lbs.). Other products are copper, manganese, mercury, sulphur, iron, cobalt, and salt. Baku (q.v.) is the centre of the petroleum industry.

The settled population is agricultural. In Ciscaucasia wheat, rye, and other grains give large returns in the irrigated districts; in Transcaucasia, corn, rice, cotton, and tobacco. There were reported in 1911, in both divisions, 22,073,000 acres under cereals, and 5,676,000 under meadows; the total cereal yield was 338,680,300 poods (winter wheat, 108,750,700; summer wheat, 52,784,100; barley, 92,938,600; oats, 21,238,000, etc.), and the total hay yield, 183,554,800 poods. In 1910 the cereal yield was 462,467,400 poods; hay, 186,059,200. Under vines are some 54,000 acres in Ciscaucasia and 150,000 in Transcaucasia, yielding in all about 30,000,000 gallons of wine per annum. There are about 150,000 acres under mulberry trees and the silkworm industry is important. The nomadic tribes carry on grazing; the live stock was estimated in 1911 as follows: 1,943,000 horses, 5,915,000 cattle, 11,600,000 sheep and goats, 1,181,000 swine, besides considerable herds of camels. The forest area (1911) was about 13,311,000 acres.

The manufacturing industries of the Caucasus are but poorly developed. The natives make rugs and long woolen cloaks, also harness, which is usually richly and tastefully trimmed with silver; these articles show no little skill and artistic sense and are exported to some extent. In the manufacture of wine primitive methods are mostly used, and the product is hardly known outside of Russia. The serious disturbances centring round Baku and Batum (1904-06) as a consequence of the Tatar-Armenian feud affected injuriously all manufacturing industries.

The transportation facilities of the Caucasus, although considerably improved since the completion of the Transcaucasian Railway, are yet

far from adequate. In many parts the pack horse is still used for transporting freight. The northern of the two chief lines of railway extends along the Caspian coast from Baku to Petrovsk; thence inland to a point near Vladikavkaz, and north into the province of the Don Cossacks to its terminations at the Sea of Azov. A branch connects the main line with Novorossiysk on the Black Sea. The southern line (560 miles) connects Baku, on the Caspian, with Batum and Poti, on the Black Sea. The most important of the other lines is that from Tiflis to Erivan (234 miles), with a branch (48) to Kars. The exports of petroleum and grain from the Caucasus to western Europe across the Black Sea are important. The petroleum flotilla on the Caspian numbers over 300 vessels.

Administratively the Caucasus forms one of the general governments of the Russian Empire and is divided into Ciscaucasia (northern Caucasasia), containing two provinces and one government; and Transcaucasia, containing six governments, three provinces, and two districts. See RUSSIA, *Population*.

The population of the Caucasus in 1897 was 9,289,364; the greatest density being 53.5 per square verst in Koutais, the least 17.2 in the Black Sea Government. The Aryans numbered 4,901,412; the Caucasians, 2,439,071 (Georgians, 1,350,275); the Uralo-Altaians, 1,902,142 (Turko-Tatars, 1,879,908); Semites, 46,739. Members of the Orthodox Greek church numbered over 4,000,000; Mohammedans of the Sunnite sect, 2,021,300, and of the Shiite sect, 884,100; the Armenians are Christians; the Kalmucks and others of the Turko-Tatar tribes are Lamanists. The total population as estimated Jan. 1, 1911, was 12,037,200. The chief cities are Tiflis (q.v.), the government capital, and Baku (q.v.), famous for its petroleum industries. There are reported 5443 schools in the Caucasus.

Keane (*Man: Past and Present*, 1899) divides the inhabitants of the Caucasus, on linguistic grounds, into four groups: (1) *Southern*—Georgians, Imeritians, Chevsurs, Lazes, Mingrelians, Pshavs, Swanittians, collectively called the Kartvelian family. (2) *Western*—Abkhasians, Circassians, and Kabardians. (3) *Central*—Ossetes, or Irons. (4) *Eastern*—Avars, Chechins, Daigs, Ingush, Kazy-Kumyksh, Kist, Lesghians, Tush, collectively called Daghestani, 'highlanders.' Nowhere else in the world, according to Ripley (*Races of Europe*, 1899), is such a heterogeneous confusion of peoples, languages, and religions gathered in one area. The number of dialects is rated at 68, representing all stages of development. The Ossete is put down as Aryan; the Circassian, including Abkhasian and Kabardian, is incorporative; some are purely agglutinative; and to these must be added later intrusions of Semitic and Aryan speech. Into the closed valleys of the Caucasian Mountains, during the migrations of peoples, came representatives of all tongues and nations, sufficiently isolated within their confined environments to preserve both physical and linguistic traits or to develop new ones.

Little is known of the early history of the Caucasus. The ancient Greeks perhaps carried on commercial relations with the tribes along the west coast, and Cape Iskuriya may have received its name from the colony of Dioscurias, established in the seventh century B.C. As shown in the writings of Æschylus and Herodotus, the Greeks knew the location of the

Caucasus Range. Georgia, the chief state, was conquered by Alexander the Great. Other portions of the Caucasus were incorporated in the Roman, and thereafter the Byzantine Empire through the control of Armenia. Muscovite interest began under Peter the Great, but not until about 1770 did Russia actively enter the region. Kuban and Terek became theirs in 1774, and Derbent, Kuba, and Baku in 1796; so that by the end of the century Russia had acquired practically all of northern Caucasia. The annexation of Georgia in 1801, after the death of George XIII, gave Russia a foothold in Transcaucasia. By cessions secured from Persia and Turkey, as well as by voluntary submissions on the part of the more peacefully inclined native tribes, Russia had obtained, by 1829, nominal control over nearly the entire country.

The courageous mountain tribes, however, aided by the general inaccessibility of the region, retained their independence, and it was only after 30 years of continuous fighting that their subjugation was accomplished. Shamil was the chief leader of the natives in whom religious zeal was combined with marvelous bravery. He gave to the resistance of the Caucasians a more organized character, defeating the Russian conquest. At last Shamil was forced to surrender at Ghunib in 1859, and Russian dominion was virtually assured. The operations in the west ended in complete success at last in 1865. A great exodus of Circassians to Turkish territory ensued. During the Russo-Turkish War in 1877-78, there was an uprising against Russian control, and the Turks lent active assistance, but the attempt proved wholly futile. Russia's success in this war secured to her a section of Turkish Armenia, which was annexed to the Caucasus. In 1905 the Caucasus was the scene of violent disturbances, racial and revolutionary. Consult: Keane, *Man: Past and Present* (New York, 1899); Ripley, *Races of Europe* (ib., 1899); Erckert, *Der Kaukasus und seine Völker* (Leipzig, 1887); Freshfield, *The Exploration of the Caucasus* (London, 1902); Wirth, *Kaukasische Zusammenhänge* (Leipzig, 1907). See RUSSIA.

CAUCASUS MOUNTAINS. A mountain range on the Caucasian Isthmus, forming part of the boundary between Europe and Asia. It extends in a west-northwest direction from the peninsula of Apsheron, in the Caspian Sea, to the peninsula of Taman, between the Black Sea and the Sea of Azov, being separated here from the mountains of the Crimea by the narrow Strait of Kertch. The range is about 750 miles in length and from 60 to 125 miles in width. The narrowest section is almost in the middle of the isthmus, where the basin of the Terek River occupies a depression that leads into the Dariel Pass. While formed by several chains running parallel, or diverging and again uniting in mountain knots, the range is remarkable for its geographical and geological unity. West of the Dariel Pass there is an almost unbroken line of mountains exceeding the Alps in elevation, which forms a veritable barrier between the regions to the north and south. Eastward the Caucasus is lower, more broken, and is cut by numerous transversal valleys. The southern slopes of the mountains are generally much sharper than the northern, which fall by gradual stages to the level of the Terek and Kuban valleys. The range includes many massive peaks of great altitude. Elbruz (18,470

feet), Koshtantau (16,900), Dikhtau (17,000), Kasbek (16,546), and other peaks overtop Mont Blanc. Elbruz and Kasbek are probably of volcanic origin. The loftier mountains carry fields of snow and ice, but the glaciers are not so extensive as in the Alps, where they have greater breadth and a lower snow line. Most of the central ranges are composed of granite and crystalline schists. On the northern slopes Jurassic and Cretaceous sediments predominate, and are continued into the Caucasian steppes, where they dip below the Tertiary and Quaternary formations. The Kuban and Rion rivers drain the western Caucasus into the Black Sea, while the eastern region is drained by the Terek and Kur into the Caspian. There are but few practicable routes across the range, the most important being from Vladikavkaz, on the northern side, through the Dariel Pass to Tiflis, which is used as a commercial and military highway.

Little Caucasus. To the south of the valleys of the Kur and Rion, in Transcaucasia, there are several mountain groups forming a broken chain that extends from near Poti on the Black Sea southeast to the Persian frontier. These groups are collectively known as the "Little Caucasus," or as the "Mountains of Transcaucasia." The highest point is Alaghez, over 13,000 feet.

CAUCHON, kô'shôn' JOSEPH EDWARD (1816-85). A Canadian journalist and politician, born at St. Rochs, Quebec. In 1842 he established *Le Journal de Québec* and conducted it until his death. He entered the Legislative Assembly in 1844 and served in it and in the Dominion Parliament after the formation of the Confederation until 1877. During 1867-72 he was Speaker of the Senate. He held cabinet offices in the Provincial and Dominion governments, and was Lieutenant Governor of Manitoba from 1877 to 1882. He published *L'Union des provinces de l'Amérique Britannique du Nord* (1865).

CAUCHY, kô'shê', AUGUSTIN LOUIS (1789-1857). A French mathematician. He was born in Paris and was educated at the Ecole Polytechnique. In 1810 he went to Cherbourg, in the capacity of an engineer, but, his health failing, he returned to Paris in 1813, renounced engineering, and chose pure science for his life work. His *Mémoire sur la théorie des ondes* was crowned by the Institute in 1815, and in 1816 he became a member of the Academy of Sciences. Later he became professor at the Polytechnic School. In 1830 he refused to take the oath required by Louis Philippe and went into voluntary exile. During his stay abroad he held for a short time the chair of mathematics in Turin, and later (1834) went to Prague as tutor of the Comte de Chambord. He returned to France in 1837, but his political views were such as to bar him from the higher professorships until the advent of the government of 1848. In that year Cauchy was made professor of mathematical astronomy at the Sorbonne, a chair which he held with a brief interruption until his death. In politics Cauchy was a Legitimist. He was known as a man of piety and was a defender of the Jesuits.

The works of Cauchy occupy a leading place in science. All parts of pure and applied mathematics, including geometry, algebra, the theory of numbers, integral calculus, mechanics, astronomy, and mathematical physics, are indebted to his discoveries. He verified the periodicity

of elliptic functions, gave the first impetus to the general theory of functions, contributed to determinants, and laid the foundation for the modern treatment of the convergence of infinite series. He emphasized the imaginary as a fundamental, not subsidiary, quantity, perfected the method of integration of linear differential equations (see CALCULUS), advanced the theory of substitutions, invented the calculus of residues, and, in general, was one of the leaders of the nineteenth century in infusing vigor into analysis. The propagation of light and the theory of elasticity also received his attention.

Consult Valsón, *La vie et les travaux de Cauchy* (Paris, 1868), and Terquem, "Analyse des travaux de Cauchy," in the *Nouvelles annales de mathématiques* (Paris, 1857). *Les œuvres complètes d'Augustin Cauchy* (Paris, 1882-1901) were published under the direction of the Academy of Sciences.

CAUCUS (of uncertain origin; possibly from *ML. caucūs*, Gk. *καῦκος*, *kaũkos*, cup, as being originally an informal festal gathering). A term applied (1) to an informal meeting of the voters of a political party within a limited district for the purpose of nominating candidates for office or of naming delegates to a nominating convention, and (2) to a conference of the members of a political party in a legislative body for the purpose of determining in detail the course to be pursued by the members of the body belonging to such party. In its former application the word is said to have been derived from the "Caulkers' Club," a political organization of some prominence in Boston during the activity of Samuel Adams. Until within a comparatively brief period this informal meeting of voters was a well-recognized and widely established feature of the American political system. In the party caucus all "regular" members of the party were considered entitled to be present and to be heard. Its participants named the party's candidates for local office and determined the policy of the party in the political district from which the members of the caucus were drawn. From the caucus of a small political unit, such as the town or the assembly district, were sent the various constituent members of a larger and similar conference representing, and acting for, the voters of a congressional district or of an entire State. Within the past two decades the caucus has assumed a new form through the statutory control of nominations to office, especially in the establishment of a system of so-called "primaries," the composition and procedure of which have in several States been made the object of as detailed and specific legislative control as are the elections themselves. The informalities which earlier made possible many questionable practices in the effort to "capture" a caucus have thus gradually disappeared and have been superseded by the routine of secret balloting by the legally registered members of a party. The nominating caucus appeared also in American politics in a conspicuous form, until 1824, in the caucus of members of Congress of each party which for a couple of decades named the candidates for the presidency and vice presidency, until the system of national nominating conventions was introduced.

The second type of caucus has not only survived, but has increased in influence and has become recognized as a legitimate feature of legislative procedure. Both in local legislative bodies and also in the various State legislatures,

and still more conspicuously in Congress, the members of each party participate in a caucus, by which are named the party's candidates for the offices of the body and by which are determined the lines of policy to be followed within the larger body. Such action is considered as binding not only upon all the participants in the caucus, but also upon all members of the legislature belonging to the party holding the caucus; and very rarely do any dissentient members of a party have the will, or the desire, to "bolt" the action of their caucus.

CAUDA-GAL/LI GRIT. See DEVONIAN SYSTEM.

CAUDEBEC-LES-ELBEUF, kôd'bêk' lâ-zêl'bêf'. A town in the Department of Seine-Inférieure, France, on the left bank of the Seine, an industrial suburb of Elbeuf, 12 miles south of Rouen. It has woolen mills, cloth factories, and dye works. Pop. (commune), 1901, 9761; 1911, 9079.

CAUDINE FORKS (Lat. *Furculæ Caudinæ*). Two high, narrow, and wooded mountain gorges near the town of Caudium, in ancient Samnium, on the boundary towards Campania, celebrated for the defeat here suffered by the Romans in the Second Samnite War (321 a.c.). Four Roman legions commanded by the two consuls, Titus Veturius and Spurius Postumius, after marching through a narrow pass, found themselves locked in a spacious valley, surrounded on all sides by lofty mountains, with no way out save that by which they entered, and another pass on the opposite side. Attempting to defile through the latter, they found it blocked up with trees and stones and commanded by the Samnites, who had also in the meantime made themselves masters of the other pass. After some days famine compelled them to surrender unconditionally. The Samnite general, Gaius Pontius, according to old custom, compelled the Romans to pass under the yoke and then permitted them to march back to Rome.

CAUDLE'S CURTAIN LECTURES, Mrs. A series of farcical papers contributed by Douglas Jerrold to the London *Punch* and published in 1846. They also form vol. iii of the author's *Collected Works*, London, 1862. They consist of a series of marital monologues delivered after retiring by a woman of decided views to her meek and sleepy husband.

CAUER, kou'ér. A family of German sculptors.—**EMIL** the elder (1800-67) is chiefly known as the inventor of the so-called "Cauersche Masse," a substitute for plaster, which it excels in durability and cleanliness, in the reproduction of statuary. He modeled many small genre figures, hundreds of which were cast in this medium. The latter part of his life was spent at Kreuznach on the Rhine, where his sons and grandsons also practiced his art.—His son, **KARL CAUER** (1828-85), was born in Bonn, studied technique with Rauch and Albert Wolf in Berlin, and the antique in Rome and in the British Museum. His portrait busts, among which are many of the royal princes and aristocracy of Europe, are lifelike and full of charm. "The Witch" (National Gallery, Berlin), "The Olympian Victor" (Sans Souci and Kensington Museum), "The Dying Achilles," and the Schiller Monument in Mannheim, are among the best known of his other works. He also designed the tomb of President Garfield at Cleveland.—**ROBERT** (1831-93), a younger brother of Karl, was born in Dresden. He first studied

painting at Düsseldorf, then sculpture with his father in Kreuznach and afterward in Rome. He is best known by the charming little statues and groups executed by the hundreds in the "Cauersche Masse," the motifs of which are taken from romantic or classic tales and poems, such as "The Sleeping Beauty," "Puss in Boots," "Hermann and Dorothea," "Paul and Virginia." He and his brother Karl were commissioned by the Prussian Ministry of Public Instruction to superintend the reproduction in plaster casts of the principal sculptures of Italy.—EMIL THE YOUNGER, HUGO, LUDWIG, and ROBERT THE YOUNGER, sons of Karl, and STANISLAS, son of Robert the Elder, are all sculptors.

CAUGHNAWAGA, kə'nā-wā'gā. See SAULT ST. LOUIS.

CAUK, or **CAWK** (provincial variant of *chalk*). The massive variety of the mineral barite, so called originally by miners in the Derbyshire lead mines. See BARIUM.

CAUL (OF. *cale*, a sort of cap, Ir. *calla*, OGael. *call*, veil, hood; ultimately connected with Lat. *celare*, to hide, Skt. *sarāna*, refuge). A thin membrane encompassing the heads of some children when born. It is merely the amniotic membrane (see EMBRYOLOGY; AMNION), which envelops every child before birth and which, on account of unusual strength or for other reasons, has escaped rupture during the act of delivery. Extraordinary superstitions have been connected with it from very early ages down to the present day. (See SUPERSTITION.) It was a popular belief that children so born would be very fortunate, and that the caul brought fortune to those purchasing it. This superstition was so common in the primitive Church that St. Chrysostom felt it his duty to inveigh against it in many of his homilies. In later times midwives sold the caul to advocates at enormous prices, "as an especial means of making them eloquent," and to seamen as an infallible preservative against drowning. It was also supposed that the health of the person born with it could be told by the caul which, if firm and crisp, betokened health, but if relaxed and flaccid, sickness or death. During the eighteenth century it was common to find advertisements in the newspapers of cauls to be sold. Similar advertisements appeared from time to time also during the nineteenth century. Consult: Brand, *Popular Antiquities* (London, 1870); *Notes and Queries*, vol. vii (London, 1849 et seq.); Jones, *Credulities, Past and Present* (London, 1898).

CAULAINCOURT, kō'lān'kōōr', ARMAND AUGUSTIN LOUIS DE, DUKE OF VICENZA (1772–1827). A statesman of the first French Empire, born at Caulaincourt, in the Department of Aisne, Dec. 9, 1772. He entered the army at the age of 15, rapidly attained promotion, and as colonel of a regiment of carbineers distinguished himself in the campaign of 1800. He was made a general of division in 1805 and in 1808 was created Duke of Vicenza. In 1807 he was appointed Ambassador to St. Petersburg, where he soon gained the confidence of the Czar, Alexander I. In 1811, on the eve of the outbreak of hostilities between Russia and France, he resigned his post, as he disapproved of Napoleon's policy. He opposed the invasion of Russia. After the burning of Moscow Napoleon selected him as his companion in his flight to France. In 1813 he was plenipotentiary to the allied sovereigns during the campaign of Saxony, and as Minister of Foreign Affairs attended the

congress at Châtillon, February, 1814. After the abdication of Napoleon Caulaincourt endeavored to make use of his influence with Alexander to obtain the most favorable conditions for the fallen Emperor, and chiefly through his intervention the island of Elba was given to Napoleon. During the Hundred Days Caulaincourt resumed office as Minister of Foreign Affairs and was made a peer. On the Second Restoration he retired to private life. He died in Paris, Feb. 19, 1827. Consult Eileroux, *Souvenirs du duc de Vicence* (Paris, 1837–40).

CAULIFLO'RY (from Lat. *caulis*, Gk. *kaulós*, *kaulos*, stalk + *flos*, flower). The production of flowers from the old wood, as in the redbud (*Cercis*). This habit is very characteristic of tropical forests, in which case possibly the thin bark explains its common occurrence.

CAULIFLOW'ER (Lat. *caulis*, stalk, especially of the cabbage, Gk. *kaulós*, *kaulos*, stalk + *flower*, from Lat. *flos*, flower), *Brassica oleracea* var. *botrytis*. A form of cabbage in which the inflorescence, modified into a flattened head or compact mass, is the edible part. It is a less strongly flavored and more delicate vegetable than cabbage and is eaten boiled with sauce or pickled. Its culture is similar to that of cabbage, but the plant is not so hardy and requires a richer and more moist soil. When the head begins to form, the outer leaves of the plant are drawn up over it and fastened. This produces a whiter and more marketable head. (For illustration, see CABBAGE.) Cauliflower seed, formerly produced almost entirely in Europe, is now grown in commercial quantities in the vicinity of Puget Sound, Washington. There are a number of varieties of cauliflower, but without marked differences between them. Early Dwarf Erfurt and Snowball are among the best. Broccoli is simply a late maturing and more hardy form of cauliflower.

CAULONIA (Lat., from Gk. *Καυλωνία*, *Kaulōnía*). An ancient Achaean city in Italy, near the Gulf of Scylaceum. It was a town of importance five centuries before Christ. In 389 B.C. it was destroyed by Dionysius the Elder. Though mentioned later, it never again attained prominence.

CAULOPTERIS (Neo-Lat., from Gk. *καυλός*, *kaulos*, stalk + *πτερίς*, *pteris*, fern, from *πτερόν*, *pteron*, wing, from *πέτεσθαι*, *petesthai*, to fly). A genus of fossil tree ferns usually recognized by their trunks and found in rocks of Upper Paleozoic and Lower Mesozoic age of many parts of the world. The name was first given by Lindley and Hutton to erect trunks found in the Carboniferous rocks. More recently the genus has been found also in the Lower Devonian of America and in the Permian and Trias of the Old World. The trunks show the places of attachment of the leaves, marked by scars, and these scars are arranged spirally about the axis. The various species are recognized by the form and size of the scars, which are generally large and of a circular or oval outline with an inner mark shaped like a horseshoe. Some of the finest examples found in America were obtained from the Corniferous limestones of the Lower Devonian of Ohio. These were described by Newberry, who considered that they grew upon an island which occupied the vicinity of Cincinnati during a time when the remainder of Ohio and the Mississippi valley was covered by a shallow arm of the ocean. The leaves known as Pecopteris in the coal measures of the Ap-

palachian region are thought to be the foliage of *Calopteris*.

CAULX, SALOMON DE. See CAUS, SALOMON.

CAUMONT, kô'môn', ACRISSE DE (1801-73). A French archaeologist, born in Bayeux (Calvados). He founded (1834) the *Société Française d'Archéologie pour la Conservation et Description des Monuments Nationaux*. Among his chief works are *Statistique monumentale du Calvados* (5 vols., 1846-47), and the valuable *Rudiment d'archéologie* (1850). Consult the biography by Beaurepaire (Caen, 1874).

CAUQUENES, kou-kâ'nés. Capital of the Province of Maule, Chile, about 187 miles southwest of Santiago (Map: Chile, C 11). Pop., 1903, 10,119; 1907, 30,073.

CAURA, kou'rá. A river of South America, a tributary of the Orinoco, which rises in the southern part of Venezuela on the northern slopes of the Sierra Pacaraima, in a number of head streams, chief of which is the Merevari, and flows generally north-northwest through the Department of Bolívar (Map: Venezuela, E 2). It is over 400 miles long.

CAUS, kô, or **CAULX**, SALOMON DE (1576-1626). A French engineer and physicist who resided in England and in Heidelberg and later in Paris. Little was known of him until Arago exhumed his works, from a study of which he reached the conclusion that he was the real inventor of the steam engine, for in one of these works he gave the plan of an apparatus for raising water by the power of steam.

CAUSALITY (Fr. *causalité*, from Lat. *causalis*, causal, from *causa*, cause). The relation in which cause stands to effect and effect to cause. Causation is causality in a temporally forward direction, i.e., the relation of cause to effect.

Of cause, causation, and causality, many views have been held. Aristotle was the first to devote much attention to the nature of causality, whereas many of his predecessors had spent much time on trying to discover particular causes for particular effects or some one general cause for the universe as a whole. But even Aristotle's contribution to the subject consisted rather in classification of various kinds of causality than in any satisfactory discussion of the ultimate nature of the relation between cause and effect. He enumerated four different kinds of causes, which have ever since had a place in philosophy. These are the material, the formal, the efficient, and the final. The material cause is what anything is made of; e.g., brass or marble is the material cause of a given statue. The formal cause is the form, type, or pattern, according to which anything is made; e.g., the style of architecture would be the formal cause of a house. Again, the efficient cause is the power acting to produce the work, e.g., the manual energy of the workmen. The final cause is the end or motive for the sake of which the work is produced, e.g., the pleasure of the owner. Aristotle mentions the case of a physician curing himself, as exemplifying all the causes in one and the same subject. Important as this classification has proved itself to be in the subsequent development of thought, it does not touch upon the problem of causality as it presents itself to the modern mind. This was due to the *naïveté* that in so many ways characterized the Greek thinkers. Aristotle assumes that there are causes and that they *produce* effects; but he does not help us to conceive the nature of the power—if power there be—exer-

cised by the cause in the production of the effect. Sextus Empiricus, probably following Ænesidemus, raised some of the problems that have ever since busied the thoughts of philosophers. First of all, he pointed out the relativity of the notion of cause, since cause has no meaning apart from effect. But, he argued, the relation has no real existence, but is merely a thought product. We *think* causality into things which are themselves free from any such relation. Furthermore, there is a difficulty about the temporal relation of cause and effect. Cause cannot be prior to the effect, for it is not cause till the effect arises. It cannot be simultaneous with, nor subsequent to, the effect, for in either case it would not be what we mean by cause. This is a subtle sophism that has puzzled many thinkers even to the present day, and has conducted much to a clearer understanding of the time relation involved in causality.

In early modern philosophy there were two rival notions of cause. Descartes and his school made cause identical with substance, while the physical scientists reduced cause to a motion or change followed by other motion or change with a mathematical equality between measures of motion. But it was Hume who first in modern times took up the problem of causality where the skeptics had laid it down. He carried out to its logical conclusion the contention of Sextus Empiricus that causality is not a real relation, but a fiction of the mind, and he used the doctrine of association to account for the origin of the fiction. Any necessary tie binding cause and effect, he pointed out, is undiscoverable by the senses; and as ideas are merely copies of sense impressions, we have no idea of causality. But we have a fiction of the imagination in regard to causality, and the fiction arises from the ease with which we pass from one perception to another perception which in past experience has been constantly and unvaryingly associated with it. "We have no other notion of cause and effect, but that of certain objects, which have been always conjoined together, and which in all past instances have been found inseparable. We cannot penetrate into the reason of the conjunction. We only observe the thing itself, and always find that from the constant conjunction the objects acquire a union in the imagination." Hence "a cause is an object precedent and contiguous to another, and so united with it that the idea of the one determines the mind to form the idea of the other, and the impression of the one to form a more lively idea of the other."

Hume's explanation of cause as a fiction which has no discoverable objective correlate led Kant to the position that the only knowable objective world is, so far as all the relations obtaining within it go, the product of mind's synthetic activity. Kant accepted Hume's skeptical result as far as it concerned itself with the world of things-in-themselves; but not being satisfied that experience is only a succession of perceptions without any discoverable coherence, he made causality one of the principles of coherence obtaining in the world of phenomena, and universally present there because always put there by thought as a part of its contribution to the nature of that world. (See KANT; CATEGORY.) Thus both Hume and Kant agree in denying independent objectivity to causality; they disagree in that the former denies also a relative objectivity to causality, while the latter asserts

such objectivity. The difference is due to the fact that for Hume the world of experience (the bundle of perceptions) is comparatively unorganized and chaotic; for Kant it is so thoroughly organized that it is regarded as a universe with relative objectivity and the relations obtaining therein as thoroughly knowable, inasmuch as they are contributions by the knower. Hegel, denying outright a transcendent world beyond experience, and recognizing, as Kant did, the universal prevalence of causality within experience, made causality thoroughly objective. But the question arises, How is it known that causality is universal within the world of experience? We have not always experienced a cause for every experienced effect; in fact, the whole problem of physical science is to discover causes for known events. How do we know they have any causes at all? Kant, as we have already seen, answers: We know, because we have made our world in such a way that everything has a cause. Hegel's answer to this question cannot be given here, as it would require too minute a discussion. J. S. Mill took up the problem here; denying the fundamental postulate of Kant's transcendentalism, viz., that the order of this world is thought-made, he seeks to justify our belief in universal causation by tracing it back to an induction (q.v.) which rests upon a larger experience than any other induction can have. The difficulty with this view is that for Mill all induction rests upon the principle of causality, and it is a circular procedure to make causality rest on induction. But circularity is in the last resort inevitable in all reasoning. (See KNOWLEDGE, THEORY OF; LOGIC.) But the difference between valid logical circularity and vicious circularity is the difference between a systematic support given to each part of experience by all other parts, and an attempt to make two judgments support each other while neglecting the concrete experience upon which all judgments must rest. Mill's circularity in the present instance is fundamentally sound, but the form in which he presents his reasoning is inadequate, and hence has led to severe criticism. Perhaps it would answer all purposes concerned to say that the tendency to make induction from observed fact is natural to a thinker. But whether any particular induction is valid is another question, to be answered only by carefully studying all the inductions that have reached satisfactory results and finding what characteristics they have in common and wherein they differ from inductions admittedly erroneous. Such a study shows that satisfactory inductions, i.e., inductions upon which we have learned that we can rely, have in common the assumption of the principle of causality as obtaining within the sphere covered by the induction. This assumption, at first and for a long time, was not consciously made, but none the less we can now see that it was made. Gradually, in certain spheres, the principle of causality came to be clearly recognized as obtaining. As time went on, the prevalence of causality in still other and other spheres was ascertained. Then the natural tendency of thought to generalize caused men to make inductions to the universal prevalence of causality. Then when the question arose as to the foundation of induction, it was finally discovered that it rested upon an unrecognized assumption of causality, even in the case where the universal prevalence of causality was the subject matter

of induction. Is this vicious? No, unless it can be shown that the assumption has led to results that are untenable. On the contrary, in this case the assumption lies at the foundation of every valuable structure raised by thought, and the tenability of the assumption is guaranteed by the validity of all that follows from the assumption and that would be invalidated were the assumption unjustifiable. See INDUCTION; KNOWLEDGE, THEORY OF.

Along with this account of the origin of knowledge of cause goes a definition of cause which is at the present day quite widely accepted. The cause of any event is a preceding event without which the event in question would not have occurred. Both causes and effects are always events; i.e., *things* in the process of change. The complete cause would be all the indispensable previous events. But as all inquiry that is of any value is confined within limits, the question as to the cause of an event is not generally a demand for a complete inventory of indispensable previous events, but for some event which, in connection with other events taken for granted, is needed to secure the occurrence of the event under discussion. According to this view of cause neither the "material cause" nor the "formal cause" is a cause; and the "final cause" is a cause only in the sense that the *idea* of the end to be obtained, together with all the desires this idea evokes, may, as an event, be an indispensable temporal prerequisite to an action that terminates in the attainment of the end. A final cause is then not a future event as an event that in time will take place, but as one now anticipated. And the anticipation precedes the effect it produces.

This brings up again the question as to the temporal relation of cause and effect. Some philosophers of to-day, following Sextus Empiricus, maintain that cause cannot be anterior to effect. This, however, is a mistake resting upon a failure to appreciate the continuous character of time (q.v.). The cause exists before the effect, but continues itself into the effect. It is to some extent an arbitrary matter where the line be drawn that divides cause from effect; but drawn it must be somewhere if one is to be clear-headed in talking about causality, and, when drawn, all the part of the continuous cause-effect process that precedes the line is cause, and all the part that follows is effect. And the line itself does not exist as a *gap* between cause and effect, but simply as the line of *juncture* of cause and effect. See CONTINUITY, LAW OF.

After all that has been said the relation between cause and effect is still left unknown, *provided* one assumes that the indispensableness of cause to effect is the result of an unknown something in the nature of the cause and of the effect. But such an assumption is ungrounded, if by nature one means a mysterious constitution of qualities. A simple view which seems to satisfy all the conditions of the case, and to leave no insoluble mystery, is that the causal relations in which an event stands are constitutive factors of the universe of which the event is a part. We do not have two self-subsistent and originally unrelated events, which are then in some incomprehensible way made to depend one on the other, as effect upon cause. Neither event is adequately thought unless its discoverable causal relation to the other is thought of as being just as real as each distinct event itself.

Thus we think of cause and effect not as magically conditioning each other, but as being different steps in a continuous process, within which each step is what it is by virtue of its relation to all other steps. Cause and effect are organically interrelated, and the organic whole within which they interact is the *ground* of their interaction.

Many philosophers deny the ultimate reality, or at least the fundamental validity, of the causal relation. Thus Josiah Royce (q.v.) maintains that the category of serial order, of which the category of cause is a particular case, is itself subordinate to the ultimate category of purpose. The world with all its relations is "there to express a perfectly definite and absolute purpose." Bergson (q.v.) is the most recent denier of the ultimate validity of scientific explanation by causes. Cause for him has indeed a practical value, but has no metaphysical significance. When we wish to secure an end, we must go about it by finding a means; the means is the cause of the realization of the end. It is a part cut out from the integral whole; the excision is artificial and subverts our ends, but does not correspond to any distinction that actually obtains apart from our interference with reality. Ultimate reality or life is not bound down by exact causal sequences. It is a process of growth in which the unpredictable and therefore the uncaused constantly occurs. There is no exact repetition in real time; and where there is no repetition there is no cause, for cause means the antecedent that repeatedly is followed by the same consequent.

Consult: Bosanquet, *Logio*, vol. i (Oxford, 1888); Bradley, *Principles of Logio* (London, 1883); Hobhouse, *Theory of Knowledge* (London, 1896), consulting index for pertinent passages; Mill, *System of Logio*, bk. iii (London, 1856); Hume, *Treatise of Human Nature*, bk. i, part iii (London, 1882); and id., *An Enquiry Concerning the Human Understanding* (Oxford, 1894); Kant, "Transcendental Logio," in *Critique of Pure Reason*, translated by Max Müller (London, 1881); and Kant's commentators, among whom may be mentioned Caird, *The Critical Philosophy of Immanuel Kant* (Glasgow, 1889), and Watson, *Kant and his English Critics* (Glasgow, 1881); Royce, *The World and the Individual* (New York and London, 1901); Bergson, *Creative Evolution* (Eng. trans., New York, 1911); Sigwart, *Logio* (Eng. trans., 1895).

CAUSATION. See CAUSALITY.

CAUSE. See CAUSALITY.

CAUSE CÉLÈBRE, kôz sâ'lêb'r' (Fr., celebrated case). A term for any specially interesting or important legal case, criminal or civil. During the seventeenth and eighteenth centuries the phrase was more particularly applied to the state trials in France. There is a French collection of *Causes célèbres et intéressantes*, by Gayot de Pitaval (20 vols., 1734), with later continuation, and Desessarts also contributed a valuable work (1785) to this branch of legal literature. Typical examples of modern cases to which the term is applied are that of Calas, who was broken on the wheel at Toulouse in 1762 on a baseless charge of having put his son to death to prevent his becoming a Roman Catholic; the Tichborne trial, in which for years (1871) all England was interested, involving the identity of a claimant to title and estates; and the recent trial of Captain Dreyfus in France, which attracted world-wide attention.

CAUSERIE, kôz'rê' (Fr., chat, from *causer*, to chat, gossip, from Lat. *causari*, to plead, from *causa*, cause, case). A term first used in a literary way by Sainte-Beuve in his famous *Causeries du Lundi*. It signifies a short, familiar paper on any subject, usually published in magazines or newspapers. As the writer is generally well known, its style is convenient where readers are interested in the author as well as in what he says. It is less formal than the generally accepted style of essay.

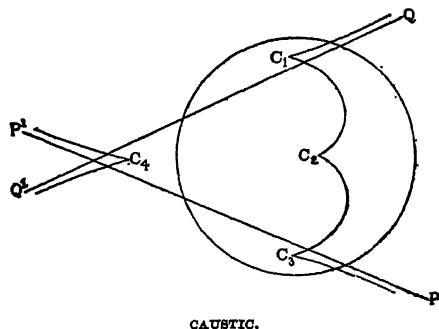
CAUSERIES DU LUNDI, du lën'dê' (Monday Chats). The modest title of collections of critiques by Sainte-Beuve, beginning with 1851. They are distinguished by brilliancy and keen analysis and are concerned not only with French authors, but also with prominent writers of other nations.

CAUSSES, kôs, PLATEAUX DES. A name applied to a barren plateau region of Cretaceous formation in south-central France, lying chiefly in the departments of Lozère, Aveyron, Hérault, and Gard. It is crossed by mountains and ravines, resembling cañons, which add to its forbidding aspect, and is very sparsely inhabited.

CAUSSIN DE PERCEVAL, kô'sân' de pèr's-vâl', ARMAND PIERRE (1795-1871). A French Orientalist, born in Paris. In 1833 he became professor of Arabic at the Collège de France, a chair formerly held by his father, Jean Jacques Antoine Caussin de Perceval (1759-1835), and in 1849 was elected to the Academy of Inscriptions. His *Essai sur l'histoire des Arabes avant l'Islamisme* (3 vols., 1847-49) is a noteworthy study. His *Grammaire arabe vulgaire* (1828) went through many editions; and he revised Boethor's *Dictionnaire française-arabe* (1827).

CAUS'TIC, or ESCHAROTIC (Lat. *causticus*, Gk. *καυστικός*, *kaustikos*, from *καυστός*, *kaustos*, burned, from *kalew*, *kaiein*, to burn). A term used in medicine and chemistry in connection with substances that disorganize or destroy living tissues. Caustics are chiefly used to destroy unhealthy growths, such as warts, granulations, or superficial tumors. *Lunar caustic* is silver nitrate fused and cast into the form of small pointed sticks. *Caustic potash* is, chemically, potassium hydroxide; *caustic soda* is sodium hydroxide; *caustic lime* is calcium hydroxide. Other caustics in common use are glacial acetic acid, the mineral acids, carbolic acid, chromic acid, arsenic, and the hot iron. See CAUTERY.

CAUSTIC. In mathematics, an envelope of rays radiating from a point and reflected or



refracted by a given curve. One form of the caustic may be readily observed by letting sunlight fall on milk, in a glass or cup not quite filled with it. Caustics are distinguished as

catacaustics (caustics by reflection) and diacaustics (caustics by refraction). The names "catoptric caustics" and "dioptric caustics" have also been applied to the two classes. The figure represents both branches of the catacaustic of a circle. The curve has four cusps C_1, C_2, C_3, C_4 , and the lines PP^1, QQ^1 are asymptotes to its two branches. The cardioid (q.v.) is a catacaustic of a circle for luminous rays proceeding from a point on the circumference. Consult Cayley, "Memoir on Caustics," *Phil. Trans.*, vol. cxlvii (London, 1857, pp. 273-312. See also vol. clvii). For further bibliography, consult the *Intermédiaire des mathématiciens* (Paris, 1894-95). See also ABERRATION, SPHERICAL; LIGHT, Geometrical Optics.

CAUTERETS, kòk't'-rà' (formerly *Cauldres*, from its hot springs, Fr. *chaud*, Lat. *caldus*, *calidus*, hot, from *calere*, to be hot). A watering place in the Department of Hautes-Pyrénées, France, 26 miles southwest of Tarbes (Map: France, S., D 6). It is in a basin called the Gave de Cauterets, 3254 feet above sea level, and is visited yearly, between May and October, by about 50,000 people, for its 24 hot sulphur springs, which range from 102° to 104° F. and are the most abundant in the Pyrenees. Pop. (commune), 1901, 1547; 1911, 1424. Consult Moinet, *Les eaux thermales sulfureuses de Cauterets* (Paris, 1878), and Senac-Lagrange, *Les eaux sulfureuses de Cauterets* (1884).

CAUTERY. A surgical procedure employed for counterirritation, to arrest bleeding, or to destroy tissue. The desired effects may be obtained by means of chemical agents, called caustics or escharotics. The term is now applied more especially to the "actual cautery," a platinum wire heated by electricity (galvano-cautery) or iron heated in a flame. In the Pacquelin cautery, invented by a surgeon of that name, the heat is maintained by a fine vapor of benzine thrown upon a platinum point after this has been heated. When employed to destroy tissue or as a counterirritant, the cautery is used at white heat; when the object is to arrest hemorrhage, it is heated to a dull or cherry-red color. If employed below this temperature, the tissue will adhere to the iron and cause unnecessary pain.

CAUTIN, kou'tén. A province of Chile, bounded by the Pacific on the west, Argentina on the east, and the Chilean provinces of Malleco and Valdivia on the north and south respectively (Map: Chile, C 11). Area, 5832 square miles. It has mountains of considerable elevation in the western part, including the active volcano Llaimas, nearly 9800 feet high. The Cautin is the chief river, the fertile basin of which yields grain and fruit in abundance. The chief export is wheat. Pop., 1885, 33,291; 1895, 78,221; 1907, 140,159; (est. Dec. 31, 1910) 161,935. Capital, Temuco (q.v.), and chief port Tolten.

CAUTIO, kà'shî-ô (from *cavere*, to safeguard, to assure). In Roman law (1) a formal undertaking to fulfill a legal obligation, especially an obligation imposed by the court upon a party to a suit. Such a judicial *cautio* was usually established in the form of a stipulation, i.e., by question and answer (see STIPULATION), with security in the form of an indentured undertaking by a surety (*fidejussor*). Of such undertakings a memorandum was usually made in writing; and thus *cautio* came to mean: (2) a written acknowledgment that a promise had been made upon oral stipulation. By further

extension, *cautio* came to mean: (3) a written acknowledgment in general, and in particular an acknowledgment of the receipt of money.

Cautio damni infecti. Literally, assurance against damage not yet done. At Roman law, when land or a building was threatened with injury in consequence of the defective condition of a neighbor's land or building, the injured person could demand from the neighbor an undertaking to make good any damages that might ensue. If the neighbor refused to give the *cautio*, the party imperiled was put in possession, and, in case of continued contumacy on the neighbor's part, was made owner of the neighboring premises. A similar *cautio* could be demanded when "new work" had been begun; and if the *cautio* was refused, the work was arrested by injunction (*interdictum*).

CAUTO, kou'tô. The largest river in Cuba. It rises in the Province of Santiago de Cuba, at a point in the Sierra de Cobre about 12 miles north of the city of Santiago de Cuba, and after a northwesterly course of about 20 miles flows west into Bucna Esperanza Bay. It is nearly 125 miles long and of considerable depth and is navigable to small boats for about 75 miles.

CAUVERY, kà'vêr-i. See KAVERY.

CAVA DEI TIRRENI, dà'ê tîr-rên'ê. An episcopal city in the Province of Salerno, south Italy, 6 miles northwest of the city of Salerno. It is a resort for Neapolitans in summer and for foreigners in spring and autumn. A short distance southwest of the town is the famous La Trinità della Cava, a Benedictine abbey founded, in 1025, by St. Alferius over the cavern he had occupied. It is now national property and contains a lyceum and a boarding school. The principal manufactures of Cava dei Tirreni are linen, silk, and woolen fabrics. Pop., 1901, 23,681; 1911, 23,817.

CAVAIGNAC, kà'vâ'nyâk', ELÉONORE LOUIS GODEFROY (1801-45). A French journalist and politician, son of Jean Baptiste Cavaignac. He opposed Louis Philippe and was one of the founders of the Société des Amis du Peuple, and of the Société des Droits de l'Homme (1832), becoming its president in 1843. He was often arrested and finally imprisoned for his part in the risings of 1830, 1832, and 1834, but escaped in 1835 and went to England. In 1841 he returned to Paris and became one of the editors of *La Réforme*, the ablest of the opposition newspapers. His statue at Montmartre is one of the best works of Rude.

CAVAIGNAC, JACQUES MARIE EUGÈNE GODEFROY (1853-1905). A French politician. He was born in Paris, May 21, 1853, the son of General Cavaignac, the opponent of Louis Napoleon. In 1868, when young Cavaignac had won a prize in the Paris schools, which was to be bestowed by the Prince Imperial, he drew back, saying: "I do not care to be rewarded by a gentleman whose father put mine into prison." The youth fought bravely in the Franco-Prussian War, and in 1872 he became an engineer. Afterward he studied law and followed this profession with success until 1882, when he entered the Chamber of Deputies from the District of Saint-Calais. From that time he had a distinguished political career. He was Undersecretary in the Department of War in 1885, Minister of Marine in 1892 and in 1895-96, and Minister of War in 1898, at a critical period of the Dreyfus affair. On July 7, 1898, he announced in the Chamber his certain belief in the guilt of Captain Dreyfus.

basing his statements on a document which a few weeks later he was compelled to confess had been forged by the notorious Colonel Henry. (See DREYFUS.) Cavaignac was the victim of his own credulity. He was defeated as a candidate for the presidency of the Republic and several years afterward withdrew from political life. Shortly after this incident he died, in September, 1905. He wrote *La formation de la Prusse contemporaine* (1897-98).

CAVAIGNAC, LOUIS EUGÈNE (1802-57). A French general. He was born in Paris, Oct. 15, 1802, and was educated in the Polytechnic School, and the Ecole d'Application in Metz. Entering the army, he rendered efficient service in Algeria, where he went in 1832, and rose rapidly in rank, becoming a brigadier general in 1844, Governor of the Province of Oran in 1847, and Governor-General of Algeria in the following year. He was, however, almost immediately recalled to Paris after the February revolution, and in May was made Minister of War. Called upon to defend the republican government during the June insurrection, he displayed energy, courage, and coolness. His operations were successful, and his clemency was as meritorious as his generalship. Though he might have made himself dictator, he resigned his power into the hands of the National Assembly, which appointed him chief of the executive body. As a candidate for the presidency of the Republic in December, against Louis Napoleon, he received about 1,500,000 votes to the latter's 5,500,000. After the coup d'état of December 2, 1851, Cavaignac was arrested, but was released after a short detention; and though he consistently refused to give his adhesion to the Empire, he was permitted to reside in France without molestation. He died of heart disease, Oct. 28, 1857, at his country house near Tours. Consult Montfort, *Biographie du général Cavaignac* (Paris, 1848), and Deschamps, *Vie de Cavaignac* (Paris, 1870).

CAVAILLÉ-COLL, ká'vá'lyá'kól', ARISTIDE (1811-99). A French organ builder, born in Montpellier (Hérault). In 1834 he obtained the commission in open competition for the organ in the church of Saint-Denis. He constructed many other important instruments for churches in France and Belgium, and introduced several excellent devices used in modern organ building. His writings include a *Projet d'orgue monumental pour la basilique de Saint-Pierre de Rome* (1875). Consult Lefebvre, *Le grand orgue de l'église Saint-Michel du Havre* (Havre, 1888), an account of a work executed by Cavallé-Coll in 1887-89.

CAVAILLON, ká'vá'yón' (anciently, *Cabelio*). A town of France in the Department of Vaucluse, situated 20½ miles by rail southeast of Avignon (Map: France, S, K 5). It is situated on the right bank of the river Durance near its junction with the Coulon. Mont Saint-Jacques towers above it. It is the centre of a rich agricultural region, also devoted to silkworm culture, and the manufacture of straw hats and leather. It is interesting chiefly for the remains of a triumphal arch of about the time of Constantine, and other relics of the Roman period found in the neighborhood. It has also a Romanesque cathedral dating from the twelfth and thirteenth centuries. From that time until it became a part of France in 1791, it was ruled successively by the counts of Venaissin and Toulouse. Pop. (commune), 1901, 9850; 1911, 9416.

CAVALCANTI, ká'vál-kán'té, GUMO (c.1250-1300). An early Florentine poet of the school of "the sweet new style," and the "first friend" of Dante, in whose judgment (*Purg.*, xi, 97) he bore off from Guinicelli the palm for lyric verse. His betrothal as a lad, and subsequent marriage to Beatrice, daughter of the Ghibelline leader, Farinata degli Uberti, seems to have been due to political considerations only, as he was one of the sons of nobility chosen to cement the hostile families by marriage. The love poems, which form the major part of his verse, are inspired by the less familiar charms of a certain Vanna mentioned by Dante, by a Mandetta of Toulouse, a Pinella of Bologna, and others, whom he celebrated in verses that evolve a philosophy of idealistic love. When the Guelph party became divided into the contending factions of Cerchieschi and Donateschi, Guido, in common with the other Cavalcanti, espoused the cause of the former, and together with the other leaders suffered exile, Dante, who was then one of the *priori*, being forced to assent to the decree. The malarial climate of Sarzana, to which he was banished, so shattered his health that, though recalled soon after, he died in August of the same year. Of Cavalcanti's poems various editions have appeared: those of Arnone (Florence, 1881), of Ercole (Leghorn, 1885), of Rivalta (Bologna, 1902), and of E. C. Lanciano, 1910). Translations by Ezra Pound (Boston, 1912), by Fletcher (in *Modern Philology*, 1910). Consult J. B. Fletcher, *The Religion of Beauty in Women* (New York, 1911).

CAVALCASELLE, ká-vál'ká-sél'lá, GIOVANNI BATTISTA (1820-97). An Italian art historian and critic. He was born in Legnago and studied painting at the Academy of Venice, but was attracted to the history of art. He studied also in Munich. He joined the revolution of 1848, and after a heroic career escaped to England. There he wrote with J. A. Crowe an important work on *The Early Flemish Painters* (1857; 2d ed., 1872) and a five-volume *History of Painting in Italy* (1864-71). This monumental work laid the foundations of the scientific criticism of Italian art and is still considered an authority. A new edition with annotations by Edward Hutton appeared in 3 vols., 1909, and a revision in 6 vols., begun by Crowe and continued by S. A. Strong and Langdon Douglas (3d vol., 1909), is in course of publication. Other important works by Crowe and Cavalcaselle are *The Life of Titian* (London, 1876), and *The Life of Raphael* (ib., 1883). The criticisms and attributions in their joint works on Italian art are usually credited to Cavalcaselle, who also wrote independently on art subjects. He was subsequently inspector of the National Museum in Florence, and director general of fine arts in Rome.

CAVALIER, ká'vá-lér' (OF. *cavalier*, Fr. *chevalier*, from It. *cavaliere*, Sp. *caballero*, ML. *cabellarius*, horseman, Celtic, from Lat. *caballus*, horse, from the Celtic or Welsh *caffyl*, horse, Gael. *capull*, mare). A horse soldier. In English history, a name applied to the adherents of King Charles I as opposed to "Roundheads" (q.v.), or friends of the Parliament.

CAVALIER. In fortification, a defense work constructed on the *terreplein*, or level ground of a bastion, so as to overlook the main parapet and thus increase the volume of fire without interfering with that of the men below and in front. See FORTIFICATION.

CAVALIER, kă'vâ-lyâ', JEAN (1681-1740). The famous chief of the Camisards (q.v.). He was a native of Lower Languedoc, the son of a peasant, and was first a shepherd and afterward a baker, and was born Nov. 28, 1681. He was driven from home by the pitiless persecution of Protestants that followed upon the revocation of the Edict of Nantes and took refuge in Geneva. When the persecution under Louis XIV drove the Protestants of the Cévennes to revolt, Cavalier returned in 1702 to his own country, where he became one of the leaders of the insurrection which broke out in July of that year. Roland was put in chief command, but Cavalier soon rose to be his equal and, though untrained in arms, he displayed extraordinary skill as well as courage. Although the "Children of God," as the insurgents were called, numbered at the most not more than 3000 men, they coped successfully with the far greater forces of the king and were never entirely conquered. After several conflicts Cavalier changed the seat of war to Vivarais, and on Feb. 10, 1703, defeated the royal troops at Ardèche. A few days later he was himself defeated, but was successful in subsequent encounters, invaded the region of the plains, and even threatened Nîmes. In April, 1704, he was defeated by Marshal Montrevel, but retreated with two-thirds of his forces. When Marshal Villars was sent against the Camisards, Roland remained obdurate, but Cavalier agreed to treat and received a colonel's commission and a pension, while his father and other Protestant prisoners were liberated. As this treaty did not secure general liberty of conscience, Cavalier was denounced as a traitor and was so disheartened by his treatment everywhere that he left France for Switzerland and from there passed to Holland, where he married. He then entered the service of England, became the head of a regiment of French refugees, and served with the English forces in Spain in 1705. After his return to England he was made a major general and Governor of Jersey, and finally Governor of the Isle of Wight. He died at Chelsea in 1740. Cavalier published in 1726 his *Memoirs of the Wars of the Cévennes*. Consult F. Puaux, *Vie de Jean Cavalier* (Paris, 1868).

CAVALIERI, kă'vâ-lyâ'râ, BONAVENTURA FRANCESCO (1598-1647). An Italian mathematician and astronomer. He was educated at Pisa and was a pupil of Castelli. In 1629 he was made professor at Bologna, where he died. His chief contribution to mathematics is the method of indivisibles, first conceived in 1629 and published in 1635. This method forms a connecting link between the Greek method of exhaustions and the methods of Newton and Leibnitz. The basal idea of the method consists in considering a line as composed of a series of points (or small line segments of equal length), a surface as composed of a series of adjacent lines (or strips of area of equal width), and a solid as composed of a series of planes (or laminae of equal thickness). In general, however, a summation of such elements, if they are finite (no matter how small), only approximates, but does not equal, the length, area, or volume of a given magnitude. E.g., consider a triangle as composed of a series of very narrow rectangles constructed on its base; the sum of such elements will differ the less from the area of the triangle, the smaller the width of the rectangles; but as long as that

width remains a finite quantity, the difference in area will, evidently, likewise remain finite.

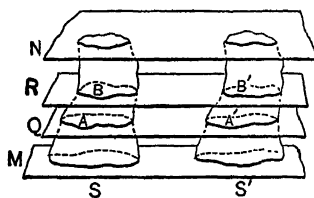


FIG. 1.

it was thus actually employed for measuring areas and volumes for more than half a century before the introduction of the integral calculus.

For example, it was used to prove the proposition that two solids lying between two parallel planes, and such that the two sections made by any plane parallel to the given planes are equal, are themselves equal; as, for example, *S* and *S'* in the accompanying Fig. 1. Such solids are called Cavalieri bodies. This forms one of the best bases for proving that the volume of a sphere is $\frac{4}{3}\pi r^3$; for, as may be seen from Fig. 2, the area of the ring *CD* is easily shown to be $\pi(r^2 - x^2)$, and this is also easily shown to be the area of the circle *AB*. Hence the sphere and the difference between the cone and cylinder are two Cavalieri bodies, and are therefore equal. Hence

$$v = \pi r^2 \cdot 2r - \pi r^2 \cdot \frac{2}{3}r = \frac{4}{3}\pi r^3.$$

This method solved many difficult problems and enabled Cavalieri to give a satisfactory demonstration of Guldin's theorem, published in the *Exercitationes Geometricæ Sæ* (1647). By means of it, also, Torricelli proved that the area of a cycloid (q.v.) is three times the area of the generating circle. Since the method of Cavalieri, combined with the modern theory of limits, offers an easy and correct way of expressing the areas and volumes of several elementary forms, and since it is a natural stepping-stone to the methods of integral calculus, it is desirable material for elementary instruction. Cavalieri's chief works are: *Geometria Indivisibilium Continuum* (Bologna, 1635); *Exercitationes Geometricæ Sæ* (Bologna, 1647); *Specchio istorico ovvero trattato delle scottioni coniche* (Bologna, 1632); *Trigonometria Plana et Spherica* (Bologna, 1635).

CAVALIERI, kă'vâ-lyâ'râ, or **CAVALIERE**, -râ, EMILIO DEL (c.1550-1602). An Italian composer. He was born in Rome of excellent family, received a good education, and was called, in 1589, to the court of the Medici in Florence as "Inspector General of Art and Artists." He had a dislike for contrapuntal music and aimed at giving expression to the monodic style by supplying an accompaniment in figured bass (*basso continuo*) and laying particular stress on the melody, which he embellished with gruppettos and trills. He wrote numerous madrigals and musical plays, of which *Dispera-*

Nevertheless, with the aid of limits, the method may be used to determine the ratio of the area of a given figure to that of another figure whose area is known. In fact,

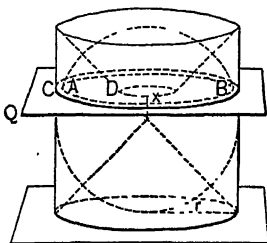


FIG. 2.

zione di Filene, Il satiro (both 1590), and *Guioco della cieca* (1595) are among the very first operas. His great work *Rappresentazione di anima e di corpo*, which was performed in Rome in 1600, is also regarded as the first oratorio. He died in Florence. Consult D. Alaleona, *Su Emilio Cavallieri* (Florence, 1905).

CAVALLARI, kǎ'vǎl-lǎ'rè, FRANCESCO SAVERIO (1809-96). An Italian archaeologist, born in Palermo. He is principally known for his discoveries of Sicilian antiquities. He was director of the School of Fine Arts in the City of Mexico from 1856 until 1863. Then he returned to Sicily and became director of antiquities there. His publications include: *Ritratti Messicani* (1866); *Belle arti e civiltà* (1868); and *Relazione sullo stato delle antichità di Sicilia, sulle scoperte e sui restauri fatti dal 1860 al 1872* (1873).

CAVALLERIA RUSTICANA, kǎ-vǎll-lǎ-rè'ǎ rōō'stè-kǎ'nà (It., Rustic Chivalry). An opera by Mascagni (q.v.), first produced in Rome, May 17, 1890; in the United States, Oct. 1, 1891 (New York).

CAVALLI, kǎ-vǎll'ǎ, FRANCESCO (c.1600-76). An Italian composer of music, whose real name was Pietro Francesco Caletti Bruni. He was born in Crema. His father was *maestro di cappella* at the church of Santa Maria, and the boy's talent gained him the patronage of Federico Cavalli, podestà of Crema, whose name he assumed. He studied under Monteverde, and was his greatest pupil and follower. He was made organist in San Marco in 1665, and in 1668 became *maestro di cappella*, holding this post until his death, in Venice, in 1676. A collection of Cavalli's church music was published in Venice in 1656, some vespers for eight voices in 1675, and an 8-part *Requiem*. But it is as a dramatic composer that Cavalli is celebrated. He treated the style developed by Caccini, Peri, and Monteverde with greater freedom in rhythm, and, though his harmony is crude, he gave greater dramatic expression to the whole. By introducing solos and set numbers into the opera, he prepared the way for Alessandro Scarlatti, the real creator of modern opera. His operas (42 in number) contain much music that is admirable even from a modern point of view. His operas include: *Le Nozze di Tetide e di Peleo* (1639); *La Didone* (1641); *Il Giasone* (1649); *Alessandro* (1651); *Il Serse* (1654); *L'Artemisia* (1656). Consult Ambros, *Geschichte der Musik*, vol. iv (Leipzig, 1878). For a sketch of Cavalli's importance in the development of dramatic composition, see *OPERA*.

CAVALLI, GIOVANNI (1809-79). An Italian soldier and inventor, born in Turin. Sent by the Piedmontese government to Sweden to investigate the manufacture of cannon, he began important experiments and in 1845 invented a breech-loading gun (6.5 in. bore), called by his name and far superior to anything then made. This gun was first used by the Piedmontese artillery at the siege of Gaeta in 1860-61. In 1865 Cavalli became commandant of the Military Academy in Turin. Besides technical papers on ordnance, he wrote on ethics, *Morale per tutti*.

CAVALLINI, kǎ'vǎl-lǎ'nè, PIETRO (c.1250-c.1330). A Roman painter and mosaicist. Although the traditional account of Vasari concerning him has been proved erroneous, his works show him to have been one of the greatest Italian masters of the trecento. His art is the

culmination of Roman mediæval painting, and while it is not free from Byzantine influence, it represents a revival of art based directly upon nature. By his influence upon Cimabue and Giotto, who saw his frescoes in Rome and Assisi, he aided in transforming the painting of Florence and incidentally of Italy. Among his frescoes in the upper church of St. Francis in Assisi are "The Adoration of the Shepherds," "Christ's Arrest," "The Building of the Ark," "The Sacrifice of Isaac," and "The Angel Visiting Abraham"; but those of the Passion in the lower church, wrongfully ascribed to him, are of the Sienese school. He painted also a number of important frescoes (now destroyed) at Rome, in old St. Peter's, Santa Maria in Trastevere, in Santa Cecilia in Trastevere (executed about 1293, newly uncovered 1901), and in the apse of San Giorgio in Velabro. Finally, he designed the mosaics of the façade and painted the frescoes in San Paolo fuori le Mura, unfortunately destroyed in the fire of 1823. His important cycle of frescoes in Naples (c.1308) has likewise perished, and so have all his panel pieces; but panels by his pupils survive in the museums of Munich, Perugia, and London.

CAVALLY (Sp. *caballa*, horse mackerel, from *caballo*, horse, from Lat. *caballus*, horse). See CREVALLE.

CAVALOTTI, kǎ'vǎl-lōt'tè, FELICE (1842-98). An Italian dramatist and politician, born in Milan. When only 18 years of age, he published *Germania e Italia*, an attack on Germany, and joined the forces of Garibaldi. Subsequently he turned his pen against the Italian monarchy and was repeatedly sentenced to imprisonment. After his release he wrote his first successful play, *I Pezzenti* (1871). This was followed by *Alcibiade* (1874), which met with extraordinary success. He was elected deputy in 1872 and frequently reelected, and was leader of the extreme Left. He edited the *Secolo*, with Rudini secured the overthrow of Crispi after Adowa, and bitterly opposed the Triple Alliance. He was killed in a duel with a Conservative editor in Rome—one of more than 30 that he fought.

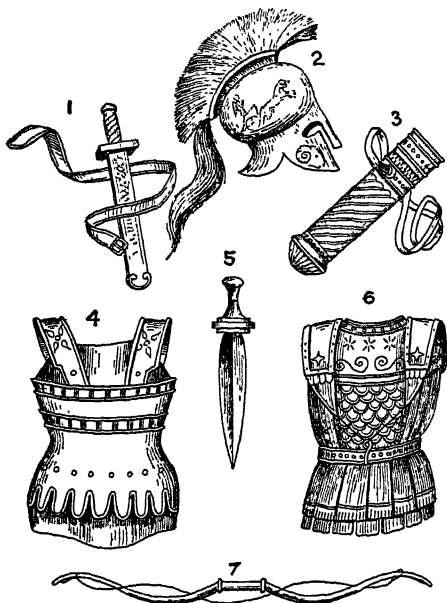
CAVALRY (Fr. *cavalerie*, It. *cavalleria*, from Lat. *caballus*, horse). A name given to soldiers trained to fight mounted, or also on foot.

ANCIENT CAVALRY

The earliest mention of military horsemen is found in the Bible. In Genesis and Isaiah the horses and horsemanship of Palestine and among the Arabs are highly extolled. Diodorus, the historian, mentions an expedition of 20,000 horsemen to put down a rebellion in Bactria. It is probable that the war chariot antedated cavalry as a fighting arm; with scythe blades attached to the end of the axles the chariot became not only a terrible engine, but was also useful to transport foot soldiers quickly to the battlefield. The creation of regular cavalry is ascribed to the Egyptian King Rameses II, about 1330 B.C.

The earliest cavalry arms were the lance, the javelin, and the bow. Of these the first named has alone survived the changes of centuries and is used to-day, side by side with the latest arms of precision and the newest weapons of war. "In a barbarous country" (says Marshal Marmont), "where industry has not yet found its way, where there exist neither manufactories

nor armories, nor money wherewithal to buy arms abroad, a man mounts his horse and wants a weapon. He cuts a long branch of light wood, sharpens the point, hardens it in the fire, and



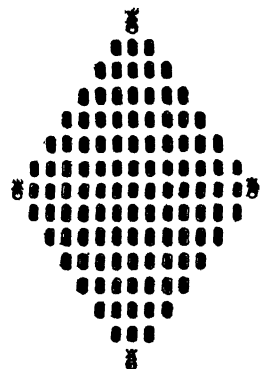
GREEK CAVALRY ARMS AND ARMOR.

1, sword; 2, helmet; 3, quiver; 4, cuirass of metal; 5, pointed sword or dagger; 6, cuirass of metal scales and leather; 7, bow.

there is his lance. Later he procures a nail and fastens it to the end; his weapon has already become more dangerous. Finally, this staff is furnished with an iron tip regularly shaped, and behold the lance which is now generally adopted." A javelin or dart is a small lance to be thrown, and was often made so as to break or bend upon piercing an enemy's body.

An early writer on horsemanship is Xenophon; he states that the Greeks used cavalry in war as early as 743 B.C. Epaminondas did much to develop this arm as a military force, raising and training a body of 5000 mounted men. The Grecian cavalry under Philip of Macedonia and Alexander the Great won great renown. It was divided at first into two classes—heavy and light—to which Alexander added a third, trained to fight either on foot or on horseback. The heavy cavalry consisted of men carefully selected and who supplied their own horses; the remainder were mounted by the state. The heavy horsemen wore cuirasses of mail, and carried a long lance and a short sword; the light horse were without armor, and carried javelins, daggers, and bows; all rode bareback.

The tactical unit of this force was the "ile" (ἵλη) of 64 men; the formation of the ile was



CAVALRY ILE.

The tactical unit of this force was the "ile" (ἵλη) of 64 men; the formation of the ile was

16 front and 4 deep, or 8 front and deep. They sometimes charged in line, but generally in oblong, wedge-shaped columns, the head of which was driven against the enemy like the point of a spear to penetrate their line; two of these triangles were sometimes joined in the shape of a lozenge, as above.

This formation was abandoned by Alexander for a more open order and extended front—that which he applied at Arbela, where he defeated Darius, King of Persia. The Greek cavalry numbered 7000, divided into two wings. The Persians, clad in armor, outnumbered their opponents, who were dressed and armed as light cavalry. Alexander, leading his right wing, rapidly extended his lines so as to overlap the enemy's front, who, in trying to meet this unexpected movement, left a gap which Alexander promptly occupied, separating the Persian forces and driving them back in confusion. Having thus disposed of part of the enemy, Alexander concentrated his force upon the remainder of Darius' army, which he routed and pursued a distance of 75 miles in 24 hours. The tactical principles illustrated in this engagement form the basis of the best modern cavalry methods. After the death of Alexander, the Greek cavalry gradually sank into insignificance.

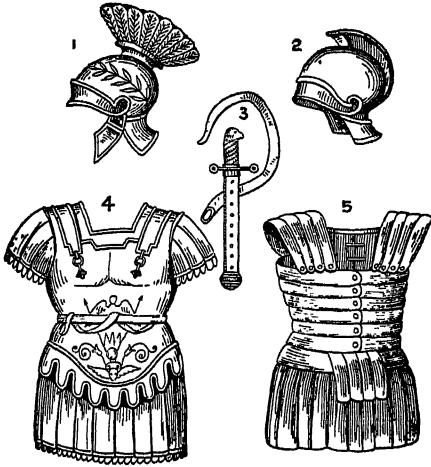
The Romans gave more attention to their infantry than to their cavalry, which, indeed, suffered from want of horses and competent leaders. Their system resembled that of the Greeks in that it comprised the heavy, the light, and a kind called *velites*, trained to fight on foot as well as on horseback. In fact, by reason of their close union with the infantry on the battlefield they were inclined to dismount upon the slightest pretext. "At Cannæ," says Polybius, "when the Spanish and Gallic cavalry, advancing from the left wing of the Carthaginians, encountered the Romans, the conflict that ensued was, indeed, most warm and vehement, such as resembled rather the combat of barbarians than a battle fought by disciplined and experienced troops. For, instead of falling back and again returning to the charge, as the custom was in such engagements, they had scarcely joined, when, leaping from their horses, each man seized his enemy." Roman writers assert that their cavalry were often successful with this method of fighting, although the modern light cavalryman would make short work of such imprudence. In their encounters with the Carthaginian cavalry the Romans sustained crushing defeats. Hannibal appreciated the value of cavalry. His favorite methods of employing the arm were (1) to turn the enemy's wings and attack him in flank and rear, and (2) to place a mounted corps in ambush and suddenly fall upon his rear. The best Roman generals, lacking cavalry, were forced to avoid the plains and take up positions upon the hills, as safer for their operations.

Eventually the Romans, whose proportion of cavalry to infantry had been one-tenth, increased it to one-fourth, with which increase and improved training, at the battle of Zama, they were enabled to drive back the Carthaginian cavalry and thereupon attacked Hannibal's infantry in flank and rear, defeating it with a loss of 20,000 men. The Roman cavalry rode without saddles, but their horses were equipped with leather housings. They were armed like the Greeks, although the sword had a very broad, sharp blade, and was worn on the right side, suspended by a belt from the shoulder; under

Vespasian the sword was removed to the left side, and its place was taken by a dagger. A helmet, a cuirass (of leather or metal), and a

stantine, nor stirrups, which were invented by the Franks. For that reason cases of hernia were quite common among these troops.

MEDIÆVAL CAVALRY



ARMS AND ARMOR OF ROMAN CAVALRY.

1 and 2, helmets; 3, cavalry sword; 4, cuirass of general officer; 5, coat of mail of soldier.

small round buckler completed the soldier's equipment.

The Romans fought with face uncovered; some of the opposing allies wore a leathern helmet closed in front, and said to be the prototype of the knight's helmet, with visor down, of mediæval times. The cavalry, when first organized in the regal period, was composed of the better class of citizens, and the *celeræ*, or king's body-guard, consisted exclusively of young noblemen. Towards the end of the Republic the knights began to withdraw from the army, and it was thereafter recruited largely from foreigners. The Roman legion originally consisted of 3000 infantry and 300 cavalry. This mounted body was, by Servius Tullius, increased to 2400. "The cavalry was divided into 10 troops (*turmæ*); the first, as the companion of the first cohort, consisted of 132 men, while each of the other nine comprised 66. The entire establishment formed a regiment of 726 horses, naturally connected with its respective legion, but occasionally separated to act in the line and to compose a part of the wings of an army." (Gibbon.) These companies, or *turmæ*, were formed in various ways—at one time in eight files and four ranks; afterward in three sections of three files or three ranks, each section commanded by its *decurio* (lieutenant), and followed by its *uragus* (file closer); and at a later period into 10 files and three ranks, commanded by the first *decurio*, the two others being posted, one on either flank.

Hannibal's auxiliaries included both Numidian and Gallic horsemen. The first were small men, on small, active horses, which were managed solely with a leather thong. In their manner of fighting the Numidians resembled the Cossacks. "In his formation for battle, Hannibal threw into the centre of his line all the bridled and heavy cavalry, and placed the Numidians on the wing, that they might be ready to surround the Romans." (Polybius.) The Gallic cavalry were perhaps the most efficient of the auxiliaries. Like the Greeks and Romans, they had no saddles, which date only from the time of Con-

stantine, nor stirrups, which were invented by the Franks. For that reason cases of hernia were quite common among these troops.

In the so-called "age of chivalry" war became to a great extent a matter of individual combat. Military science languished during a period devoted to knights in armor—tournaments at which fair ladies encouraged champions to "break a lance." Indeed, that weapon became the real badge of nobility; and in France at one time serfs were forbidden to use it. The lance was reserved, under the laws instituted by William the Conqueror, for the use of "freemen." Eventually, in consideration of its practical value, the lords permitted their vassals to use, in time of war, a lance, the head of which was never burnished, and at the close of the war was hung on the wall and allowed to rust, "lest the vassals should grow too proud." To this day, in France, the old gun blackened with smoke or the rusty sword may be seen over the fireplace of the peasant, as in mediæval times rested the smoked lance of his forefathers. Other arms of this period were the long, heavy sword, two-edged, often straight on one side and waved on the other; an axe added to the pike became the forerunner of the halberd—the "morgenstern" (morning star) of the Germans, used by the Swiss at the battle of Morgarten (1315 A.D.), and the "goaden dag" (good day), which the Flemings used with terrible effect at the battle of Courtrai (1302). Other rude weapons, inventions of the blacksmith, were called *gisarms* or *bisarms*. The nature of these weapons caused a revival of the heavy plate armor of the ancients, vastly improved in point of flexibility, and worn both by horse and rider. The expense of this outfit was of course enormous. At the siege of Harfleur (1415), Comte Saint-Pol's "chanfrain" (horse-head armor) cost \$30,000, and that of Comte Saint-Foix \$15,000; both were inlaid with gold and jewels. The horses were more vulnerable than their riders, as their legs were exposed to attack. The rider, when dismounted, was assailed with mace, battle-axe, or stones, in the attempt to crack his shell. At the storming of fortresses the knights dismounted and fought on foot, and Pere Daniel says "that the splendor and extent of victories was always denoted by the number of knights, squires, and other gentlemen who had been killed or taken." Tactics were unknown among the early knights. In battle they formed in single rank, and each sought out his opponent and rode against him with couched lance, in order to disable or capture him.

While one may smile at the mediæval horseman with his cumbrous armor, still his training in the use of arms, management of his horse, and self-reliance were valuable from the cavalry point of view. While that arm as a force in war had lost prominence, it was by no means dead. At the beginning of the eighth century the Frankish army was largely composed of mounted men. In the tenth century Europe suffered greatly from the incursions of the Hungarian horsemen until Henry I of Germany, reorganizing his cavalry and adopting the methods of the common enemy, finally defeated them. In 1241 the Mongols invaded central Europe and encountered the heavy, armor-clad cavalry of those regions, and the struggle between the two sys-

tems ended in victory for the light horsemen. The Mongols would not stand a charge, but, dispersing, would exhaust their opponents in pursuit, and then, rallying, would turn and, rush-



KNIGHT MOUNTED, 1558.

ing upon the broken masses, speedily decide the contest.

The application of gunpowder to war purposes in Europe early in the fourteenth century (although its origin is variously ascribed to the Chinese and to the Arabs) wrought a revolution in things civil as well as military. War became a science, and in 1445 Charles VII of France first organized a standing army and infused new life into the cavalry arm. The soldiers were assigned to permanent quarters and placed under rigid discipline. The men who formed

the retinue of the knight (called "servientes," the original of our "sergeant"), took the name of gens d'armes. The King divided his cavalry into 15 companies of 100 lances each, the term "lance" meaning a "squad"; thus each company numbered 600 mounted men, making an aggregate of 9000. There were also volunteers attached to the gendarmerie on probation. Each homme d'armes had four horses, including his war charger, mounted only when battle was imminent. Thus, it is



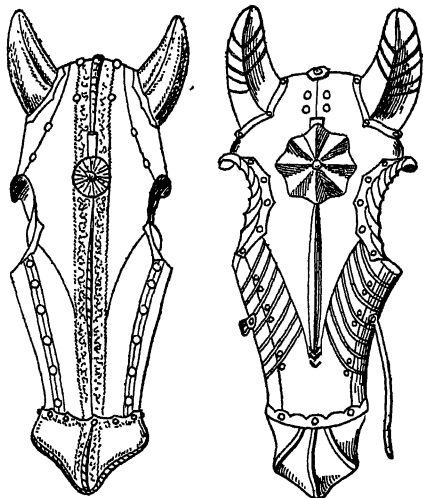
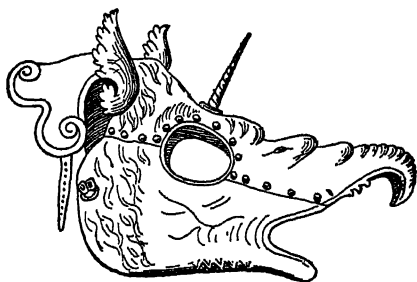
GERMAN REITNER, 1640.

said, originated the expression, "mounting one's high horse," or showing a readiness to quarrel.

The towns and provinces, in return for the protection afforded by this force, bore the expense of their support. In 1559 the last vestige of the romance of war (the tournament) was destroyed by the death of King Henry II of

France, who, while engaged in a joust, was unhorsed and accidentally pierced through the visor of his helmet by a lance in the hands of a courtier, Count Gabriel de Montgomerie.

About the beginning of the fifteenth century we find mention for the first time of certain kinds of cavalry whose names are familiar at the present day. In Hungary the "hussars" so called from the Hungarian word *húsz* (signifying "twenty") and *úr* (pay), were organized under a state ordinance requiring every twentieth man to take the field. They were armed with a sword (sometimes two), rode small horses with light saddles, were well disciplined, and very mobile in battle. Mahan well describes the type: "The dashing, bold hussar, that epitome of military impudence and recklessness at the tavern, should present these qualities in a sublimated form on the field. Regardless of fatigue and danger, his imagination should never present to itself an obstacle as insurmountable." The hussar has always been noted for extravagance in dress, but the Polish hussars at the time of the war with Charles XII were unique. "They march," says Voltaire, "attended by several valets, who lead their horses, which are adorned with bridles, plaited with silver and silver nails, embroidered saddles, saddle bows and



"CHANFRAINS"—HORSE-HEAD ARMOR.

stirrups gilt, and sometimes made of massive silver."

Long before this we hear of "carabineers" (from the Arab word *Karab*). They were armed with an arquebuse, a pistol, and a long, straight sword; they were drilled to load at full speed

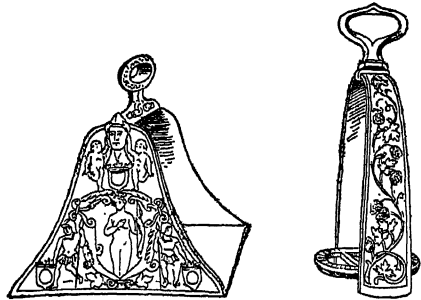
and to fire from the saddle. Placed on the flanks of squadrons, they prepared the way for the charge by their effective fire. In England they were called "hargobusiers." They occasionally took up infantrymen behind them. This use of horsemen to move infantry rapidly in an emergency originated the term "dragoons." See MOUNTED INFANTRY.

CAVALRY IN MODERN TIMES

The War of Independence of the Netherlands (1568-1609) marked the beginning of a new era in cavalry history. Maurice of Nassau drilled his German mercenaries, more lightly armed and mounted than their Spanish opponents, to form in two or three lines, to move rapidly, and to make direct charges, after first firing their pistols at the enemy. He it was who first organized regiments of 1000 men, raised by selected recruiting officers who became the colonels; their commissioned subordinates were called lieutenant colonels and majors, as in the armies of to-day.

The great improvement begun by Prince Maurice was continued and enlarged by the great soldier Gustavus Adolphus. He made important changes in the discipline, armament, pay, clothing, and training of his cavalry. They were formed in four ranks, of which one was held in reserve during a charge. Unlike their foes, they were frequently paid, and to a certain extent restrained from such excesses as were common in those times. Captain Dalgetty's view, "A cavalier of honor is free to take any part which

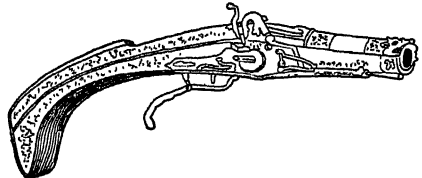
(1631) and Lützen (1632). They became models for all European states, and Louis XIII of France still further reduced cavalry formation to three ranks. The armament and equipment



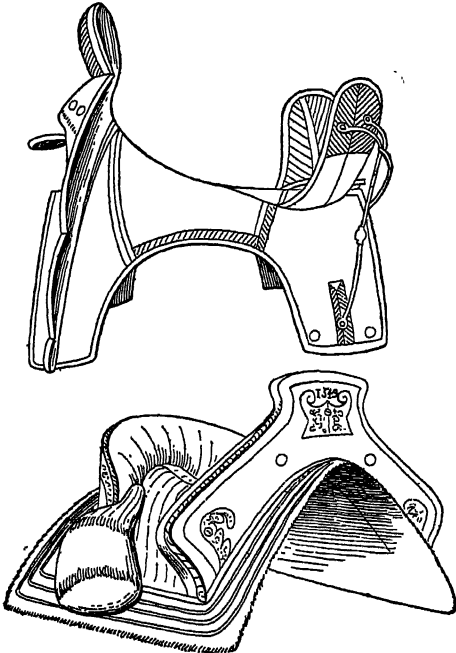
ORNAMENTED CAVALRY STIRRUPS.

were also lightened, but movements were not so rapid in action.

In the reign of Louis XIV there appeared a galaxy of stars military in the persons of Turenne, Luxembourg, and Condé on one side, and



EARLY CAVALRY PISTOL, "THE DRAGON."



SADDLES OF MEDIEVAL CAVALRY.

he may find most convenient for his own peculiar," was the popular one. The Austrian cavalry was heavier than the Swedish, with a more massive formation (8 to 10 ranks), and thus his mounted troops contributed greatly to Gustavus' successes at the battles of Leipzig

Marlborough, Montecuculi, and Eugène on the other, and a decided advance was made in the movements of armies, but no important changes in cavalry methods. Again, the Swedes came to the front under the rule of Charles XII, and radical alterations were instituted. He made the cavalry independent of the infantry and taught it to rely upon the sword and bold and impetuous charges for success. "His daring and chivalrous character was suited to the spirit of cavalry tactics; he led his horsemen, sword in hand, against cavalry, against infantry, against fortified positions, over any country. . . . Untiring in pursuit, he followed up the Saxons under Marshal Schulenburg in their retreat into Silesia for nine consecutive days without unsaddling, overtook them at Sünitz, near Punitz, and, with two regiments of cavalry only, charged them, 10,000 strong, rode over their infantry, who lay down to avoid the impetuous rush of the Swedes, defeated and drove the Saxon cavalry off the field, and then returned to attack the infantry and guns." (Nolan.)

After Poltava (1709), war ensued between Russia and Turkey, in which the cavalry of the latter power, which had long been the best in Europe, bore a conspicuous part. Their horses, admirably trained, their sharp scimitars, and skill in harassing the enemy made them a terror to the less mobile Russians, whose infantry were compelled to carry with them portable chevaux de frise and add pikes to their armament in order to hold their own against the Turks. In the Polish army, about 1717, there were the Tatar hussars who bore a cuirass covered with a panther's skin slung over the back, the head being fastened on the left shoulder. The back-

piece of the cuirass was adorned with feather wings. They carried a gilt lance 14 feet long with a small flag near the point which, fluttering in the attack together with the rustling of the wings, was intended to frighten the enemy's horses. The French in the meanwhile, under Louis XV, restored the lance, but otherwise lightened the equipment of their mounted troops. The brilliant Marshal Saxe recognized and applied the experience of the Austrians and Russians to the development of the French cavalry. As to the importance of mobility, he held that "the secret of victory resides in the legs of the soldiers," and as to horsemen, "such as cannot go at speed over a couple of thousand yards to pounce upon the foe is good for nothing in the field."

Frederick the Great ushered in a brilliant cavalry epoch. At the commencement of his reign his army of 80,000 contained 60 squadrons of heavy and 51 of light cavalry—about 13,000 men. They were "heavy" in every sense—their quickest gait the trot, their most serious performance a pipe-clay parade. At the battle of Mollwitz they received a lesson from the Austrians, who charged them in the Turkish manner and drove them, including their royal master, in confusion from the field. Frederick profited by this example to reorganize his cavalry after the methods of Saxe, laying down a rule that "all evolutions are to be made at the greatest speed . . . the cuirassiers to be as handy and expert on horseback as a hussar, and well exercised in the use of the sword. Every squadron as it advances to the charge must attack the enemy sword in hand, and no commander shall be allowed to fire under penalty of infamous cashiering. . . . Every officer of cavalry must ever bear in mind that there are but two things required to beat the enemy: first, to charge him with the greatest possible speed and force; and second, to outflank him." With these admonitions, and led by the invincible Seydlitz and Ziethen, the Prussian cavalry performed wonderful feats in the historic battles of Strigau, Rossbach, Leuthen, and Zorndorf. The Prussian leaders combined great boldness with skill in manœuvring in the presence of the enemy, of which Rossbach (1757) was an instance. The French and Imperialists, confident in their numbers, approached carelessly, exposing their flank to the Prussian advance under Seydlitz, who instantly, without waiting for his infantry, charged with his 4000 mounted men and completely routed the allies, who lost 3000 killed and wounded, 5000 prisoners, and 70 guns. (Wagner.) At Zorndorf (1758) the success was still greater. There Seydlitz with 26 squadrons not only turned the fortunes of the day, but checked the victorious Russian cavalry, drove it from the field, returned, fell upon the Russian infantry, which stoutly resisted, and when broken by the Prussian horsemen rallied, again and again, but finally gave way with immense loss. Ziethen was equally distinguished, and by his vigilance at Hochkirch (1758) saved Frederick and his army from a surprise. It is said that of 22 general engagements Frederick's cavalry won 15. "In reviewing the deeds of the Prussian cavalry of those days it must be borne in mind that they dealt with infantry which sought the open plain, advanced in long lines—avoiding obstacles of all descriptions, because such obstacles disturbed their array. Their fire was quick, but not true in its aim, and their

squares seldom held out long against the horsemen." (Nolan.)

Napoleon endeavored to introduce Frederick's methods into the French cavalry. In 1806, at Jena and Auerstädt, he first pitted his cavalry against the Prussians with brilliant results. The boldness which characterized the Prussian system was reproduced, but the speed in the charge, skill in manœuvres, and good judgment on the battlefield were often lacking. The French, with 80,000 cavalry, were badly mounted, not good horsemen, heavily equipped, and, while employed in masses, seldom provided reserves. A notable instance of the last-named defect occurred in 1813 near Leipzig. Murat, at the head of 5000 horse, charged the centre of the allied army, rode down the Russian cavalry of the guard, took 30 guns, and pierced the enemy's centre; but 400 Cossacks, skillfully handled, attacked the French cavalry, gaining their flank by a narrow bypath, retook the guns, and caused Murat to retire in disorder. A similar error at La Rothaire resulted in the loss of 28 guns to Napoleon. There were some brilliant exceptions to these failures, the most important being Kellermann's decisive charge at Marengo (1800), when the Austrians, having practically defeated the French army, were advancing with more zeal than care; suddenly a French battery, hitherto concealed by an accident of ground, fired a parting shot at the head of the Austrian column which caused great confusion. General Kellermann, at the head of 200 sabres, seized the opportunity to fall upon the enemy's exposed flank, rode over the leading battalions, and produced a panic in the entire allied force, which fled from the field, leaving behind them their commander and 2000 prisoners. But if less fortunate in operations en masse, Napoleon surpassed Frederick in the use of cavalry on outpost and scouting duty. His troopers were ubiquitous as the "eyes and ears" of his army. While Napoleon's cavalry was taught to place its principal dependence upon the sabre, he authorized, on occasions, the use of firearms. At Eylau (1807) the colonel of the Twentieth Chasseurs à Cheval observed a large force of cavalry advancing towards his position, moving slowly through the snow and heavy ground. Ordering his officers into the ranks and his men to "advance carbine," the colonel waited until the enemy's leading files were within six paces, when the command to fire was given with great effect. Although in the *mêlée* which ensued the French regiment lost 100 men, the Russians left nearly 300 on the spot from which they were forced to retire. (Wagner.) At Somo Sierra, in the Peninsular campaign (1808), the Third Polish Light Cavalry charged directly in front of an intrenched battery strongly supported by infantry guarding a mountain defile, drove back the Spaniards, and captured 16 guns. This desperate but successful feat was accomplished by General Montbrun, who led the regiment in person.

In Spain, at that time, there were many gallant actions. Under Wellington the cavalry of the German legion attached to the British army was conspicuous, making, on one occasion, according to the French general Foy, "the most daring charge during the Peninsular War." At Garcia Hernandez (1812), when the French army was retreating, three squadrons of Bock's German brigade, which had been ordered to charge the cavalry of the enemy's rear guard,

unexpectedly encountered three battalions of infantry formed in squares. Without hesitation Bock's cavalry charged these squares, successfully penetrating them at places where wounded horses or falling men had caused a gap in the side of the square. The vigor and skill with which this small force (about 110 sabres) was handled resulted in the dispersion of the French infantry with a loss of 1 general officer and 1000 men; the German casualties were 4 officers, 48 men, 67 horses killed, and 2 officers, 56 men, 46 horses wounded, with 6 men missing.

Napoleon's disastrous Russian campaign demoralized his cavalry. The intense cold, deep snows, want of food for horses and men, and ceaseless encounters with the Cossacks reduced the French horsemen in numbers and spirit. General Morand says of the Cossacks: "These natural horsemen are not organized in divisions, pay no attention to regular alignments, rest their feet in great stirrups which serve as supports when using their weapons; trained to pass at once from the halt to the gallop and from the gallop to the halt, their horses second their dexterity. These ungroomed animals of irregular size, supplied by their riders, possess wonderful endurance, are guided entirely by the snaffle, and easily accomplish 100 verst (66 miles) in 24 hours." Their method of attack, in Napoleon's time called "the lava," consisted of a charge in small, irregular groups—in open or close order as circumstances seemed to require—these "groups" hovering around the enemy until launched at a vulnerable point. Since then the close association with the regular system of the Russian army has caused the lava to degenerate into a simple "charge as foragers." In some respects the Cossack methods are not unlike those of the North American Indian of the plains.

The Crimean War was remarkable for the cavalry errors committed. Neither the Russians nor the allies employed the arm effectively either for reconnaissance, outpost, or in large bodies on the battlefield. The most unfortunate instance of this nature, the charge of the Light Brigade at Balaklava (1854)—where gallant men were sacrificed through the folly of their commander and the ambiguity of an order gained undying fame by a poet's pen. On the same field the heavy cavalrymen of both armies met—the one body at a slow pace, the other at a halt—with negative results. From the experience of the Crimea and that of the Italian campaign of 1859 doubts arose as to the value of cavalry in future operations, Austria making a decided reduction in that arm. "The awakening from this transient period of theory came from a nation not trained to arms, and it is to the American Civil War that we owe the revival that took place in the use of the cavalry arm." (Liddell.)

The experience gained in the Civil War in the United States (1861-65) laid the foundation for renewed confidence in the value of mounted troops and led to many changes in the armament, equipment, and instruction of European cavalry. At the outset the aged General Scott and the new commander of the United States forces (McClellan) did not expect that a large mounted force would be needed. In the North and West people were not accustomed to the saddle; in the South the majority were good horsemen. So it happened that the Confederates, at the beginning of the war, displayed greater mobility in

their operations, screened them effectually, and were better informed as to the enemy's movements than were the Union troops. The lesson of the first year taught the United States government the importance of a due proportion of cavalry in the composition of its armies, and by the spring of 1863 the Union cavalry were able to cope with the Southern horse. The mounted service of the United States in 1861 consisted of two regiments of dragoons, one of mounted rifles, and two of cavalry, variously armed, but later in that year another regiment was created and all were armed alike, with carbine, pistol, and sabre, were taught to fight as "dragoons," and were denominated "cavalry." On this basis was organized a great body of volunteer horsemen, eventually aggregating 300,000. The Confederates created their mounted force principally from the many mounted militia regiments and the thousands of good horsemen with which their section of the country abounded; these were officered in many cases by ex-officers of the United States army and by young planters. For want of carbines and sabres many Southern organizations were armed with rifles, but as a rule with sabre and pistol. It has been said that these troops were not "cavalry" in the European sense. On the other hand, it has been urged that they were cavalry of the most efficient and versatile description.

In 1862 the Confederate cavalry leader Stuart, with a small brigade and a battery, made a reconnaissance (or so-called "raid") from Richmond, Va., passing entirely around the Army of the Potomac, in position near that city, obtaining valuable information as to McClellan's position, destroying supplies, driving in outposts, swimming swollen streams, and returning home by a swift détour with the loss of one officer killed. In 1863 the Union general Pleasanton made a reconnaissance in force with 7981 cavalry, 3000 infantry, and 24 horse-artillery guns to discover, if practicable, General Lee's intentions. The movement was carried out with so much secrecy that upon crossing the Rappahannock River early in the morning of June 9, the enemy's cavalry—8500 strong, with 20 guns—was surprised, but, recovering, engaged Pleasanton's command near Brandy Station, and a great cavalry battle ensued which lasted ten hours and ended with the ultimate withdrawal of the Union troops unmolested, at nightfall, having accomplished their purpose. The action was spirited, and a number of mounted charges were made in which the sabre was freely used, although there was some dismounted work with the carbine. The infantry did not take an active part, but remained in reserve, covering Beverly Ford in the rear of the Union force. Pleasanton's casualties aggregated 932; those of Stuart about 500; the loss in commissioned officers was heavy. The occasion marked a new departure in the history of the war; in the language of Colonel McClellan, chief of staff to General Stuart, "It made the Federal cavalry. Up to this time confessedly inferior to the Southern horsemen, they gained, on this day, that confidence in themselves and their commanders which enabled them to contest so fiercely the subsequent battlefields."

At Gettysburg (1863) General Buford, in advance of the Union army with two small brigades of cavalry, 2500 strong (dismounted), and a battery of 6 rifled guns, defended the approaches to that field, delaying the advance of a corps of

Confederate infantry, who believed that they were opposed to an infantry force. Buford's skill and boldness enabled Reynolds's corps to reach the field in time to secure the advantage of position for the Union army. The Comte de Paris, writing of this affair, says: "This first inspiration of a cavalry officer and a true soldier decided, in every respect, the fate of the campaign. It was Buford who selected the battlefield where two armies were about to measure their strength." On the third day of the battle an encounter took place between the cavalry of Stuart (6000 sabres) and Gregg (5000), in which the former was thwarted in an effort to gain the rear of the Union line, simultaneously with Pickett's famous charge upon its front. Each cavalry division was accompanied by 3 batteries (about 12 guns) and engaged in a series of mounted charges and individual combats with mediæval ferocity, resulting in the withdrawal of the Southern horse and casualties of 10 per cent of the forces engaged. The nature of the fight was shown when a fatigue party detailed to bury the dead "found two men, who had cut each other down with their sabres and were lying with their feet together, their heads in opposite directions, and the blood-stained sabre of each still tightly held in his grip." At another point lay "two men, one a Virginian, the other a Pennsylvanian, who fought on horseback with their sabres until they finally clinched and their horses ran from under them. Their heads and shoulders were severely cut and their fingers so firmly embedded in each other's flesh that they could not be removed without force." (Miller.) Another typical instance of the value of cavalry trained after "the American fashion" follows. At Cold Harbor, Va. (1864), during the Wilderness campaign, Merritt's brigade of 800 (regulars and volunteers) Union cavalry were dismounted at the edge of a wood, with orders to hold the position at all hazards. The horses were hidden in a ravine in the rear. One-half of this force was armed with Springfield breech-loading carbines, the other half with Spencer magazine carbines; all had pistols and sabres. Behind a barricade of fence rails, carbine in hand and ammunition by his side, each cavalryman awaited the enemy. Soon after, the head of an infantry force (McLaw's Confederate division) was discovered moving through the woods in column of companies, armed with Austrian muskets and sword bayonets. They advanced unsuspectingly until within 100 yards, when a volley from the cavalry met them. The incessant fire from the magazine carbines made a terrific noise, set the woods on fire, killed and wounded many of the enemy, threw them into confusion, and, believing themselves in the presence of a superior infantry force, they fell back out of range. This delay enabled Grant to occupy the ground upon which was fought the great battle of the following day. The Civil War contains numerous examples of brilliant cavalry operations which have served to place the names of Sheridan, Buford, and Stuart by the side of Seydlitz and Ziethen on the cavalry roll of fame.

In 1866 the "Seven Weeks' War" between Germany and Austria was too brief to furnish any new cavalry lesson. One or two brilliant actions occurred; at Benatek, where a squadron of Prussian hussars surprised a Hungarian battalion as it emerged from a wood and captured a flag, 16 officers and 665 men, and at Tobit-

schau, where three Prussian squadrons attacked batteries in position and captured 16 guns. The greater war between France and Prussia (1870-71) was distinguished for the excellence of the German mounted scouts and the failure of the French cavalry. Three famous charges equally desperate (one French, two German) against the enemy's infantry marked this war. That of the French failed, but the Germans were successful, although the French formations remained intact. The cavalry casualties were very heavy. The German cavalry was inferior to the French in fire action, and the Uhlans were powerless in presence of the "Franc-tireurs" (Home Guards). At Vitray a whole Prussian cavalry brigade was detained for 12 hours by 12 chasseurs d'Afrique armed with carbines, who by dexterous dismounted tactics successfully posed as infantry. In 1877-78 the war between Russia and Turkey was comparatively barren in cavalry results, if we except the famous Balkan expedition under Gurko. The Spanish-American War (1898) was uneventful from the mounted point of view. The South African War and the operations in the Philippines have shown how important and indispensable a well-mounted and trained cavalry is. The theoretical views as to the disappearance of cavalry in face of modern firearms have vanished. The influence of the South African War of 1899-1902 on the future organization, equipment, and employment of cavalry will be found treated under MOUNTED INFANTRY.

The work of the cavalry in the Russo-Japanese War (1904-1905) was, in general, disappointing on both sides. The Russians had about 30,000 men, the difficulty of transporting horses limiting their numbers; the Japanese had about 6000 men, probably because their horses are not suited to the work and their men but little accustomed to riding. The Russian cavalry was poorly handled, and no real cavalry leader was developed among their commanders. The Japanese cavalry was so weak in numbers that it had to keep within supporting distance of its infantry and artillery, but rendered important service in securing information.

The cavalry regiments of the European armies, with the exception of the Austrian, by 1914 for the most part were equipped with the lance; this was more largely due to the example of the German army than to actual demonstration of superiority in recent wars. The modern tendency, however, is to attach increased importance to dismounted fire action, consequently the rifle and the bayonet have been adopted by the cavalry of the principal Powers; only France and Italy retain the carbine. The campaigns of Sheridan and Stuart are studied at the cavalry schools of Europe, and the lessons derived therefrom were being applied to an unusual extent at recent manoeuvres.

In the wars in North Africa and the Balkans (1912-13) the cavalry rendered important service, but there were no noteworthy examples of shock action. To-day all armies are working with great energy on the improvement of the organization and tactical instruction of their cavalry, showing that the importance attached to this arm has not been diminished. In the United States army the cavalry, which for over 50 years has had a single-rank formation and an organization differing materially from European types, in 1913 was experimenting with the French drill and with a regimental organization resembling the Austrian, in which the regiment

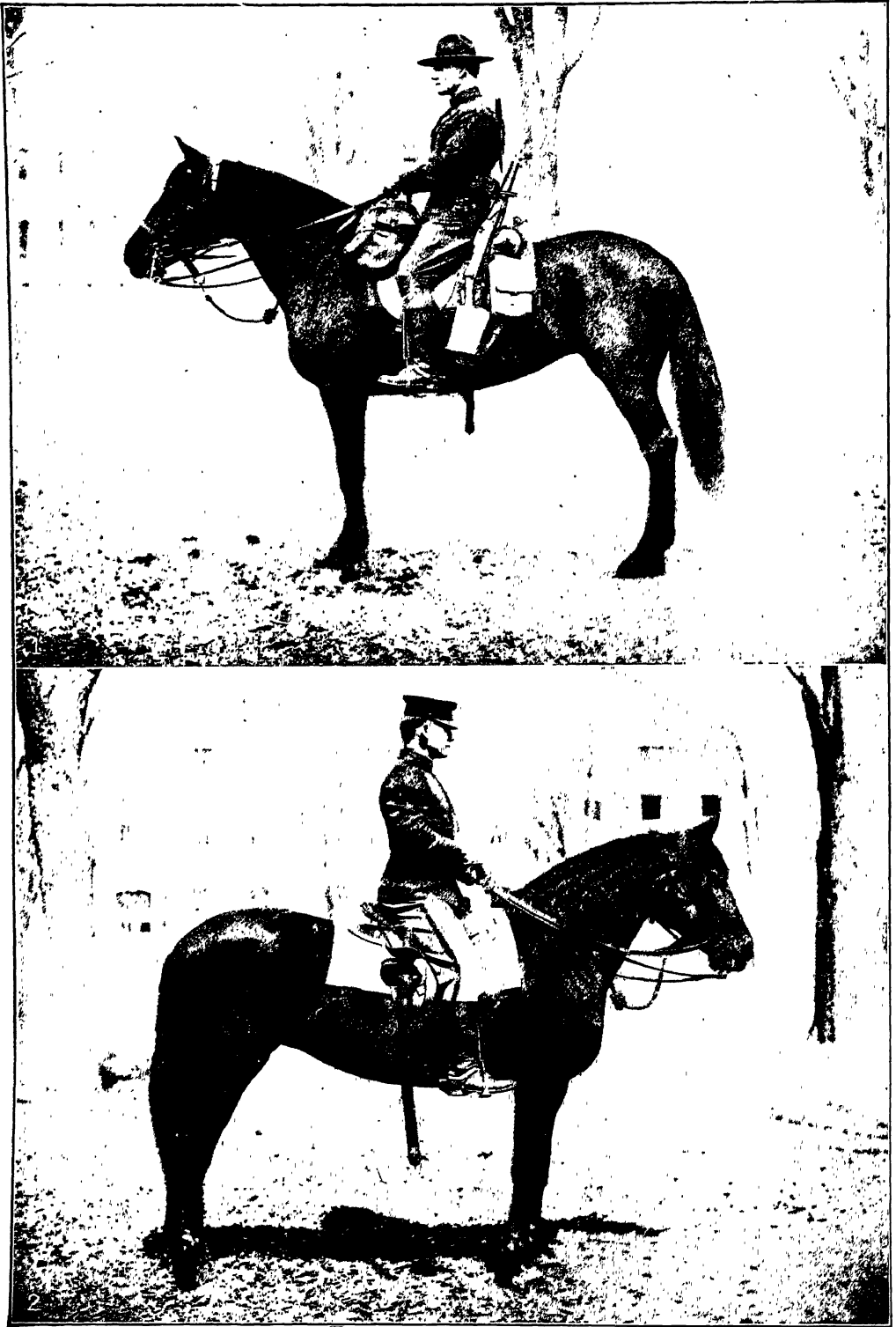
CAVALRY—UNITED STATES ARMY



1. CAVALRYMAN OF THE REVOLUTIONARY WAR.
2. CAVALRYMAN OF THE EARLY ARMY, 1799-1802.
3. DRAGOON—Mexican War Period.
4. CAVALRYMAN—Period of the Civil War.

5. DRAGOON—Period Before the Civil War.
6. CAVALRYMAN—Full Dress Uniform, 1888-1902.
7. CAVALRYMAN IN SERVICE DRESS (Blue), 1890.
8. CAVALRYMAN IN SERVICE UNIFORM (Olive Drab), 1914.

CAVALRY



A UNITED STATES ARMY CAVALRYMAN AND EQUIPMENT

1. SERVICE UNIFORM. PACKED SADDLE. FULL EQUIPMENT
2. FULL DRESS UNIFORM, SHOWING SABRE CARRIER

sists of six squadrons. This would be a return to the organization of the American cavalry in force more than 70 years ago, except that both the squadrons and the regiment are considerably larger, whereas in nearly all of the European armies the number of squadrons in a regiment has been reduced to four. The British cavalry regiment in 1913 consisted of three squadrons.

The voices which, after the first favorable experiments with dirigible balloons and aeroplanes, declared that cavalry could be dispensed with in reconnaissance, are silent, and it is now recognized that these technical developments serve to increase the opportunities and enhance the value of cavalry as the fighting force of greatest nobility.

THE CAVALRY OF TO-DAY

The condition of this arm of service in the principal nations of the world (1913-14) may be summarized as follows:

AUSTRIA has 42 regiments of regulars (15 dragoons, 16 hussars, 11 Uhlands); total, 46,910 (all are light cavalry). Also, 6 regiments of Imperial Landwehr, 4350, and 10 regiments of Hungarian Landwehr, 5736. Arms: sabre and repeating Mannlicher carbine. Each man carries water bottle and 2 ammunition pouches. Total weight carried by horse, 297 pounds. There are three remount depots; peace effective, 78,000 horses and mules; Imperial resources, 3,500,000 animals. On mobilization, 250,000 horses would be required.

BELGIUM, 8 regiments; total, 7608.

BRAZIL, 12 regiments of 4 squadrons each, and 5 regiments of 2 squadrons each; total, 3732.

BULGARIA, 11 regiments.

CHILE, 8 regiments.

DENMARK, 4 regiments of 3 squadrons each, and 5 reserve squadrons. Peace strength varies greatly according to season. War strength is not known.

EGYPT, 10 squadrons—1100. Arms: lance (front rank), sabre, and Martini carbine.

ENGLAND, 31 regiments regular (5 heavy, 13 medium, 13 light)—20,472. Regiment consists of 3 squadrons of 4 troops each. Household regiments are of 24 officers, 430 men, 275 horses. Line regiments (home), 26 officers, 696 men, 465 horses and mules; (India), 29 officers, 624 men, 592 horses. Arms: Lee-Metford carbine, sword; also lance in lancers and front rank of dragoons. Total weight carried by horse, 252 to 276 pounds. The Yeomanry (volunteer horse), 10,000, largely recruited from young farmers. In Great Britain and Ireland about 3,000,000 horses, of which 70,000 are fit for military purposes; about one-fifth of these are registered. The Anglo-Indian cavalry consists of 40 regiments (native)—24,937—besides the 9 regiments (British) already mentioned. Each regiment consists of 4 squadrons, 10 British officers, and 625 natives (all ranks). India supplies its own horses.

FRANCE has 91 regiments (12 cuirassiers, 32 dragoons, 23 chasseurs, 14 hussars, 4 chasseurs d'Afrique, 6 Spahis)—71,200 (all ranks). Four squadrons and 1 depot squadron, 37 officers and 792 men to each regiment. Arms: sabre and magazine carbine; also lance, except for cuirassiers. Sabre and dynamite cartridge on saddle, carbine over shoulder. Cuirassiers wear cuirass weighing 13 to 16 pounds. Horses required on mobilization (all arms), 480,000. There are 8

remount companies, total strength 2392, and 20 remount depots.

GERMANY has 103 regiments of cavalry, as follows: Prussia—10 cuirassiers, 26 dragoons, 19 hussars, 21 Uhlands, 1 heavy cavalry, and 6 Jäger zu Pferde; Saxony—1 heavy cavalry, 2 hussars, 2 Uhlands; Württemberg—2 dragoons, 2 Uhlands; Bavaria—2 heavy cavalry, 2 Uhlands, 8 chevaux-légers. Total strength, 2585 officers, 70,370 men. Regimental organization: 4 squadrons and 1 depot squadron. Peace strength of squadron: 5 officers, 142 men. Arms: lance, sword, and carbine; noncommissioned officers carry a pistol. The carbine, which is practically a rifle, is carried in bucket on off side of saddle. Horses available (peace), 70,000. Seven new regiments have been added (1913), bringing the total up to 110 regiments. Armament with rifle and bayonet appears to be experimental.

GREECE has 3 regiments (12 squadrons), about 1400 men. Arms: Gras carbine and sword.

ITALY has 29 regiments, each of 5 squadrons. Arms: carbine, bayonet, long sword; the first 10 regiments carry a 9-foot 9-inch lance. There are about 750,000 horses and 300,000 mules in Italy. The cavalry in peace requires 23,000.

JAPAN has 89 squadrons of cavalry, formed into 19 regiments of 3 squadrons and 8 regiments of 4 squadrons each. The strength of the squadron is 5 officers and 136 men. In time of war each regiment is to be augmented by 2 reserve squadrons. Total peace strength is kept secret, probably about 15,000.

MEXICO, 14 regiments and 4 skeleton regiments—634 officers, 7166 men. (Returns before the disturbances of 1913.)

THE NETHERLANDS, 4 regiments of 4 squadrons each.

NORWAY, 16 squadrons formed into 3 regiments.

PORTUGAL, 8 regiments—270 officers, 4920 men (peace).

RUMANIA, 20 regiments of 4 squadrons each; 21 depot squadrons, and 3 squadrons in the escort regiment.

RUSSIA's cavalry consists of 66 regiments (4 guard cuirassiers, 4 guard light cavalry, 58 line dragoons) and 2 regiments of 6 sotnias in the Crimea and Daghestan, and 4 independent sotnias; the cuirassier regiments are 4 squadrons; the others, 6 squadrons. Each regiment (peace), 816-1143; (war), 708-1015; to each will be attached 1 officer, 16 men trained for scouting and courier duty; also another detachment 2 officers, 16 men for pioneers and signal duty. Arms: curved sword, rifle, and bayonet; the rifle slung over shoulder—is similar to infantry rifle. Each man carries 40 rounds. Saddle packed with two "wallets," forage sack, cloak, intrenching tool, picket pin, spare horse-shoes, canvas water bucket, etc.; total weight carried by horse (exclusive of rider), 119 pounds. The Cossacks number (peace) 54 regiments or 323 squadrons; or (war) 152 regiments and 42 independent squadrons—935 squadrons in all, by adding the 2d and 3d levies of the Cossack reserve; strength of regiments varies from 660 to 1100 (all ranks). Arms: sword without guard, rifle, and (front rank) lance—except Kuban Cossacks. Each man carries 2 bandoleer pouches, containing 40 rounds; only snaffle bridle and light saddletree resting on felt pads. Weight carried (exclusive of rider), 97 pounds. The aggregate (peace) strength of the Russian cavalry is 5600 officers, 125,000 men.

The number of horses available is 23,000,000; required in war by all mounted troops estimated at 450,000. On mobilization, 80 squadrons of Imperial militia cavalry may be called out.

SERBIA, 4 regiments, 1674 men and horses. Arms: Mauser carbine and sword. War strength, about 9000.

SPAIN has 29 regiments of 4 squadrons and 1 depot squadron each, and some special squadrons, making 154 squadrons. Effective total: 1671 officers, 14,402 men. Arms: 7 millimeters carbine and sword; 8 regiments carry lances.

SWEDEN has 8 regiments (3 bodyguard, 5 line) —250 officers, 3366 men.

SWITZERLAND has no standing army, but provides a permanent corps of instructors, 15 being authorized for cavalry militia instruction. In war the cavalry force first mobilized is estimated at 5107, armed with Mannlicher carbine and sword.

TURKEY has (war) 203 squadrons—32,300 (all ranks). Arms: carbine and sword. The "Hamidieh" (military cavalry) is organized under tribal leaders and officered by officers of the regular army.

THE UNITED STATES regular cavalry consists of 15 regiments of 3 squadrons of 4 troops; each troop (war), 100 noncommissioned officers and privates; aggregate strength of regiment (peace footing), 866 (all ranks). Arms: rifle (Springfield, 1903), sabre, and revolver. Saddle (McClellan) packed with blanket, greatcoat rolled, side lines, picket pin, canteen, meat can, knife, fork, and spoon, forage sack, spare shoes, etc.

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CAVALRY AND LIGHT ARTILLERY SCHOOL, UNITED STATES. Until 1907, the popular name of a service school of application for the cavalry and field artillery arms of the United States army; located at Fort Riley, Kansas.

In 1907 the name was changed to "Mounted Service School." Its object and courses of instruction were radically changed at that time. See **MOUNTED SERVICE SCHOOL**; **SERVICE SCHOOLS**; **MILITARY EDUCATION**.

CAVALRY SCREEN. One of the important duties of cavalry is to obscure and cover the designs or direction of the army for which they are acting as a screen. Reconnaissance to find the enemy is usually made by cavalry, ranging in strength according to the situation, but in large commands appearing, generally, as *independent* brigades or divisions. On such duty cavalry not only gathers information, but also *screens* the main command by keeping the enemy at a distance. These bodies of *independent* cavalry usually push forward one or two marches ahead of the main command. A brigade of three regiments will normally form a screen of 10 miles front. The success of the German troops during the War of 1870 was greatly facilitated by the conspicuous efficiency of the Uhlan cavalry in this particular branch of cavalry service. See **ADVANCE GUARD**; **TACTICS, MILITARY**.

CAVAN. An inland county in the south of Ulster, Ireland (Map: Ireland, D 3). It lies in the narrowest part of Ireland, 20 miles from the Atlantic and 18 miles from the Irish Sea. Area, 746 square miles. About three-fourths is arable, and considerable quantities of grain are produced. Of minerals, Cavan affords coal, iron, lead, and copper, and there are many mineral springs. Agriculture forms the chief industry, but linen is manufactured to some extent. The capital is the little town of Cavan. The population, which numbered 243,260 in 1841, has decreased steadily—to 97,541 in 1901, and 91,173 in 1911.

CAVANILLES, ká'vá-né'lyás, ANTONIO (1805-64). A Spanish historian and jurist. He was born at Corunna and was educated at Alcalá. His greatest work is the *Historia de España* (1861-63), a history of Spain to the reign of Philip II. It combines conciseness and clearness with eloquence of diction and is ranked among the best works of its kind. Its author became in 1841 a member of the Royal Academy of History, and in 1857 was elected to membership in the Royal Academy of Moral and Political Sciences.

CAVATINA, ká'vá-té'ná (It., short air, arietta). Originally a vocal, generally an operatic, air, usually sentimental in character and differing from the aria in consisting of one division only and in maintaining the same tempo throughout. *Salut demeure* in Gounod's *Faust* is a familiar example of a cavatina. The term is also applied to short instrumental pieces of that character. Generally they are written for a solo instrument with piano. Perhaps the best-known piece of this kind is Raff's cavatina for violin.

CAVAZZOLA, ká'vá-tsó'lá, IL, properly, PAOLO MORANDO (1486-1522). A Veronese painter of the Renaissance. He was born in Verona, where he studied under Bonsignori and Francesco Morone, and where practically all of his life was spent. He was the most typical representative of the Veronese school, excelling all of its masters in sureness of line, beauty of form, in movement and power of expression. Uninfluenced by Venetian color, he painted in the gray harmonies of his home, with fine tonal and atmospheric effect. In the composition of

his later works the influence of Raphael appears. His masterpiece is a series of five scenes from the Passion, now in the Verona Gallery, one of which, "The Descent from the Cross," is probably the most beautiful painting of the Veronese school of that period. Other fine works are "St. Rocco" (National Gallery), "Madonna with the Baptist" (ib.), "The Doubting Thomas" (Verona), "Christ Crowned with Thorns" (ib.), and a large altarpiece of the "Madonna in Glory" (ib.), his last picture. Cavazzola's portraits are expressive and strongly modeled; excellent examples are those of Emilio degli Emili (Dresden Gallery), Emilia Trivulzio (Milan), and the "Warrior and his Page" (Uffizi), formerly ascribed to Giorgione. Consult Aleardi, Paolo Morando (Verona, 1853).

CAVE, or **CAVERN** (OF. *cave*, *caive*, from Lat. *cavea*, cave, from Lat. *cavus*, hollow, Gk. *κῆψ*, *kyar*, hole, from *κῆν*, *kyein*, to swell, to contain). A hollow place in the earth's crust. Aside from the subterranean excavations made by man, caves are produced by the fracture and dislocation of strata during periods of upheaval, by the action of water, or by both causes combined. The eroding and dissolving power of water has formed caverns along river courses and on seacoasts. The moving waters enter natural crevices and enlarge them by the abrasive action of the suspended sand and gravel, or they attack the softer portions of the strata and form cavities that are inclosed by the more indurated rock. Wave action is a prominent agency in this process. Caves most frequently occur in limestone regions, where they are usually the result of the solvent action of water and the contained chemical agents, such as carbon dioxide and humic acid. The surface waters in percolating downward through the joint fissures and along the planes of stratification enlarge the channels by solution. Rivers sometimes plunge into the caves through openings known as *sink holes*. In some limestone regions, as portions of Kentucky and Florida, these holes are a marked surface feature. Many caves are of enormous size. The cave of Gailenreuth in Franconia, Germany, that of Kirkdale in Yorkshire, the Mammoth Cave of Kentucky, and Luray Cavern of Virginia, as well as many others, are celebrated for their magnitude or scientific features. Rock formations containing beds of salt, a material easily removed by water, may also abound in caverns. They are also frequently met with in igneous rocks—the picturesque cave of Fingal, in Staffa, is formed in basalt; and in South America and Iceland the recent lava contains large caverns.

Many caverns have a calcareous incrustation lining their interior, giving them a gorgeous appearance. Sometimes this deposit is pure white, and has, when the cave is lighted up, a richness and transparency that cannot be imagined. It is, however, more generally colored by the impurities which the water has taken up from the superincumbent strata. To the incrustations which are suspended from the roof, like icicles, the name *stalactite* is given, while those rising from the floor are designated *stalagmites*. Sometimes the pendent stalactites are produced so as to meet the ascending stalagmites and form pillars, as if to support the roof, as in the "organ" in the Blue John Mine, Derbyshire, and the columns of the Mammoth Cave. The source and origin of this deposit has been satisfactorily explained by Liebig as follows: "The

mold of the superficial soil, being acted upon by moisture and air, evolves carbonic acid, which is dissolved by rain. The rain water thus impregnated, permeating the calcareous strata, has the power of taking up a portion of the lime, which it retains in a liquid condition, until from evaporation the excess of carbonic acid is parted with, when the lime again returns to its solid state, and forms the incrustation."

Caves serve as places of shelter for animals, some of which have taken therein permanent abodes and have acquired in their changed surroundings certain characters that differentiate them from related types living in the open. (See CAVE ANIMALS.) Man also has made use of caves for shelter or permanent habitation, very frequently, it would appear, in the early period of human development included within the Paleolithic and Neolithic ages. The records of his occupancy, as well as the presence of animals, during past ages are found in the remains that have been preserved by burial in the cave earth which results from disintegration of the wall rocks or that have been incrustated with a deposit of stalagmitic limestone and thus protected from decay. Bones of animals are frequently uncovered, some of them representing types that lived in late Tertiary and Pleistocene times. Human bones are less common, but other evidences of man's occupancy are supplied by domestic utensils, charred wood, and implements of various sorts. The so-called bone caves of western Europe have yielded a wealth of material relating to prehistoric man and his contemporaries. The more noted examples of the kind are in England, France, Belgium, and western Germany; their exploration has been carried on very actively within the last century with results of great importance to archaeology, anthropology, and the geological sciences.

In the successive layers of deposits in these European caves have been dug up relics relating to the Roman, Iron, Bronze, Neolithic, and Paleolithic cultures, of which the last dates back into the Pleistocene, if not so far back as the first ice invasion, at least to late Glacial time. The occurrence of bones of the reindeer, musk ox, and Arctic fox indicates a cold climate during a part of the earliest or Paleolithic stage, and man at that time may have found caves a welcome shelter from the cold. On the other hand, it has been found that the cave man was also a contemporary of such animals as the mammoth, rhinoceros, hippopotamus, cave hyena, lion, and other types which we are accustomed to associate with warm climates and which have long since become extinct or have retreated from European territory. No complete skeleton of Paleolithic cave man has yet been discovered, only fragments of skulls and bones; but the abundant relics of his handiwork give a fairly good representation of certain features of his mode of life and stage of social development. They show that he subsisted for the most part on animal food obtained by hunting and fishing, for he had no domestic animals and apparently knew nothing of agriculture. His knives, spearheads, and other implements were rudely fashioned of flint or bone, and he clothed himself in skins. In short, he lived much as do the Esquimaux who have been unaffected by civilization. Among the most interesting objects of the cave man are the pictures which he traced upon the walls

of his abode or chiseled upon fragments of bone and antler. These refer mainly to animals like the reindeer or mammoth with which he came in contact, although a few show human heads and figures, such having been found in the caves of southern France, e.g., the Grotte des Fées and the cave of La Colombière. In the Neolithic caverns the advance of culture is already very marked, so much so as to lead to the inference that Neolithic man belonged to a distinct race, one that perhaps migrated from the East. The implements are of more varied pattern and more neatly turned, although they still consist mainly of stone. There are attempts at pottery making, and the art of weaving may have been discovered. Of the extraordinary group of Pleistocene mammals that have been named in connection with Paleolithic man, nearly all had died out or had migrated, the musk ox and reindeer retreating to the north; the Irish elk remained on and probably lived in historical times. In the place of those animals came the domestic kinds—the horse, cow, sheep, and goat—and with them, no doubt, the beginnings of agriculture.

Among the famous bone caves may be mentioned those of Kirkdale in Yorkshire; Kent's Hole in Devonshire; Gailenreuth in Franconia, Germany; Spy, Belgium; and those in the valleys of the Dordogne, Vézère, and Ain rivers in southern France. The Kirkdale cavern was made famous by the work of Buckland in 1820, who was one of the first to employ scientific principles in the exploration of cave deposits. The cave yielded great numbers of mammal bones, including over 300 individuals of the cave hyena. In the Kent's Hole cave, investigated by McEnery between the years 1825 and 1841, was made one of the first authentic discoveries of human relics in association with bones of Pleistocene mammals, and the evidences brought forward by McEnery in support of the view of a contemporaneous burial were hotly contested at the time, but have since gained acceptance on the part of scientists. The cave showed a series of deposits dating back through the Roman and earlier periods to the Paleolithic, of which the remains buried in a stalagmitic layer included those of the lion, hyena, mammoth, and others, with flint implements and an engraved reindeer antler. Other caves which have yielded relics of Paleolithic man include the grotto of Spy in Belgium, and Cromagnon, Comberelles, La Madeleine, Le Moustier, and La Solutré of France. In the cave of La Colombière, beside the river Ain, France, a remarkable series of Paleolithic sketches engraved on bone and smoothed stones was unearthed in 1913. The bone caves of America have less interest from the standpoint of archaeology and anthropology, though they have afforded some interesting animal remains of Pleistocene age. In most of them, however, the bones are of more recent date. Consult Badin, *Grottes et Cavernes* (Paris, 1870); Boyd Dawkins, *Cave-Hunting* (London, 1874); Hovey, *Celebrated American Caverns* (Cincinnati, 1882); Baring-Gould, *Cliff Castles and Cave Dwellings of Europe* (Philadelphia, 1911). See COLOSSAL CAVERN; JACOBS CAVERN; LURAY CAVERN; MAMMOTH CAVE; WYANDOTTE CAVE.

CAVE, ALFRED (1847–1900). An English clergyman and educator, born in London. He was educated at New College there, held pastorates at Berkhamstead and Waterford from 1872

to 1880, was professor of Hebrew and Church history in Hackney College (1880–82), and later he served this institution as president and professor of theology. He was vice chairman of the London Board of Congregational Ministers in 1888 and 1898. He published *Scriptural Doctrine of Sacrifice and Atonement* (1877); *An Introduction to Theology* (1886); *The Inspiration of the Old Testament* (1888); *The Battle of the Standpoints* (1890); *The Spiritual World* (1894).

CAVE, EDWARD (1691–1754). The founder and editor of the *Gentleman's Magazine*, the first literary journal of its kind ever published. He was born at Newton, in Warwickshire, was educated at Rugby, and became a printer's apprentice in London. For a time he held a parliamentary clerkship, and from the information gained through his official position he furnished country news to a London newspaper and weekly news-letters to country papers. In 1727 he and Robert Raikes were fined and imprisoned for breach of privilege. In 1731 he was able to set up a small printing office and established the *Gentleman's Magazine*, which he conducted the rest of his life and which is still published. Dr. Johnson was among the early contributors to the magazine, and Cave published several of his earlier works, including *Irene* and the *Life of Savage*. Cave began, in 1732, the publication of a regular series of the parliamentary debates of both Houses, Johnson writing many of the speeches reported in the series. Following a reprimand in 1745 for publishing an account of the trial of Lord Lovat, Cave discontinued these reports until 1752.

CAVE, WILLIAM (1637–1713). An English clergyman and scholar. He was born at Pickwell, Leicestershire, studied at Cambridge, and held various ecclesiastical appointments, among them the rectory of All-Hallows the Great, London (1679), and of Isleworth in Middlesex (1690). He was chaplain to Charles II, and in 1684 became canon of Windsor. His fame rests on his voluminous writings on Church history, the most important of which are: *Primitive Christianity* (1672); *Lives of the Apostles* (1676); *Lives of the Fathers* (1677); and *Scriptorum Ecclesiasticorum Historia Literaria* (1688–98), which were once standard works.

CAVE ANIMALS. A name given to a peculiar assemblage of animals living in the total darkness of caverns. Cave animals usually differ from their epigeal or out-of-door allies in being blind and either partially or totally eyeless, in having the loss of sight compensated for by greatly developed feelers and other appendages or by tactile hairs, and in being whitish or colorless, the coloring matter or pigment in the skin having undergone degeneration.

Cave Fauna. The richest cave fauna occur in southern France, in limestone deposits near or at the base of the Pyrenees, though the great grotto of Adelsberg, near Triest, is the classic abode of cavernicolous forms, including the blind triton, eyeless beetles, etc. In North America Mammoth and Wyandotte caves, with many smaller ones in their vicinity, as well as the caves in Carter Co., Ky., also Weyer's Cave and the Luray Cavern in Virginia, have been especially explored, and have yielded a most varied and interesting fauna. These regions have been honeycombed by the action of subterranean streams now mostly dried up. With these systems of subterranean drainage are

associated sink holes, and deep, dark wells inhabited by blind fish, crayfish, and other crustacea of the same species as those inhabiting the caves. Other caves more or less tenanted by blind forms are situated in Mexico, at Cachuamilpa, in open sink holes in Cuba, as well as in caves and wells in New Zealand. The caverns inhabited by permanent assemblages of blind animals both in America and Europe lie south of the ice sheet of the Glacial period. The cave fauna probably became established at the beginning of the Quaternary epoch, i.e., very soon after the close of the Tertiary period.

Taking the Mammoth Cave as the type of a great system of underground passages and chambers, let us consider the conditions under which these blind animals live. The total length of the avenues is about 150 miles. In the older and dry passages and chambers there is little life; the animals are mostly congregated in the newer or comparatively damp places, the aquatic forms living in the streams and pools. There is no vegetation, except a few scattered molds and fungi. The food is scanty, and the animals are all carnivorous, preying on one another. The temperature is very equable, the mean for the winter months being 53° F., and for the summer 54° F., the variation throughout the year being scarcely more than 1°.

The number of species thus far detected in Mammoth Cave is about 75, and in other American caves about 40 or 50 more, while there are several hundred kinds existing in European caverns.

Blind Fishes. The most striking and interesting form in Mammoth Cave is the blind fish (*Amblyopsis spelæus*). It is about 4 inches long, pale or colorless, blind, the eyes being vestigial. According to Prof. C. H. Eigenmann, who has made the latest and most thorough studies on this and other blind fishes, *Amblyopsis* seeks the dark and shuns the light. A ray of light or a lighted match will cause them to dash away, and bright sunlight appears to be irritating; if exposed to it, the fishes swim about uneasily. In well-fed adult specimens there is no external indication of an eye; but in young ones, before reaching a length of 2 inches (50 mm.), the eyes can be distinctly seen, owing to their pigment, which is lost in the adult. The optic nerve can be traced in examples under an inch (25 mm.) in length, but in larger specimens "it is no longer possible to follow the nerve to the brain." In only one instance could Eigenmann trace the nerve into the brain cavity. The lens is much reduced, and, in fact, the vestiges of the eyes are exceedingly variable, "in striking contrast to the condition in normal fishes." (Eigenmann.) This will apply to the eyes of other blind fishes and blind insects, crustacea, etc. While the sense of sight is lost, that of touch in the blind fish, as in most other cave animals, is exalted. *Amblyopsis* is provided with series of tactile papillæ, arranged in ridges on the front and sides of the head. Though the ears of this blind fish are said by Wyman to be largely developed, Dr. Sloan, who kept several of these fishes in an aquarium for 20 months, states that they "manifested total indifference to light and sound." They are said to show in their movements extreme timidity and caution. Eigenmann has proved that, contrary to early views, *Amblyopsis* is not viviparous; the eggs, however, are laid by the female under her gill membrane, and the

breeding period extends at least from the first of March to November. The young feed on minute crustaceans and other microscopic animals, and the older ones feed greedily on the blind asellus (*Cæcidotæa*). Like all other cave animals, the body is colorless, and the blind fishes glide through the aquatic shades like "white aquatic ghosts." There are four other species of blind fishes, and with *Amblyopsis* is associated *Typhlichthys subterraneus*, which lives in caves east of the Mississippi, while *Typhlichthys rosæ* inhabits caverns west of this river.

Subterranean Salamanders.—A still higher type of vertebrate, two species of salamanders, have become adapted to cave life, losing their eyesight by disuse. The species of the genus *Spelerpes* frequent damp, dark situations and the entrance to caves. An allied form (*Typhlotriton spelæus* of Stejneger) is distinctly a cavernicolous as distinguished from a twilight species, and has never been found outside of caves. Its eyes show early stages of degeneration. It inhabits caves in southwestern Missouri and occurs under rocks in and out of water. Still another salamander, whose eyes are the most degenerate known among amphibians, is the *Typhlomolge rathbuni* of Stejneger. It lives in subterranean streams, tapped by an artesian and also a surface well, near San Marcos, Tex., and likewise occurs in one of the caves near that town. Its remarkably long and slender legs are too weak to support its body when out of water. The eyes of this salamander are in many respects much more degenerate than those of the *Proteus* of Austrian caves. It has no eye muscles, the retina is more reduced, no trace of the lens could be found except in one individual, and no blood vessels enter the eye, the shape of the eye itself, which lies just beneath the skin, being very variable. (Eigenmann.)

The *Proteus* of Adelsberg Cave is a salamander-like form, allied to our mud puppy (*Necturus*). It has external gills, very weak legs, ending in three toes in the fore and two in the hinder pair. Its body is remarkably slender, white or colorless, and the eyes are minute, just visible beneath the skin. It is noticeable that when this animal is kept in the laboratory, exposed to daylight, the stimulus of the light rays causes the pigment to develop so that the skin turns slightly dark.

The lower animals tell the same story of degeneration, blindness, and total or partial atrophy of the eye, together with loss of color, and, in a more striking way, the compensation for the loss of vision by a great increase in length of the antennæ and other appendages, or the growth of long, slender tactile bristles.

Blind Crayfish and Insects.—A notable inhabitant of Mammoth and other caves is the blind crayfish (*Orconectes pellucidus*). It differs from its out-of-door allies in being blind, slender-bodied, and colorless. The eyes are present, but they are much reduced in size and destitute of a cornea and of black pigment, while the colorless body is slender. It is not only blind, but deaf, as A. S. Packard discovered that the auditory sacs are a third smaller, and the auditory hairs in the ears also a third shorter and smaller; hence it is to be inferred that the ears of the blind crayfish are degenerate, and the sense of hearing nearly, if not quite, obsolete. This creature is also exceedingly timid and cautious in its movements.

The eyeless beetles of caves (*Anophthalmus*)

have no vestige of eye or of optic nerves and ganglia; but in their movements they closely resemble their epigean allies. While their bodies and appendages are slender, they grope their way about by means of very long tactile bristles. They act exactly as if enjoying good eyesight. They walk, run, stop to explore the ground, seek their food, and run from the fingers of the insect hunter who tries to seize them, with the same agility as beetles provided with eyes. Other beetles, such as *Adelops*, which have retained vestiges of the outer eye; some spiders, comprising an eyeless species, and others with eyes varying in size, some much reduced, spin little webs on the walls of the chambers. Among the harvestmen some have extraordinarily long legs; while the *Campodea*, a wingless insect of the Mammoth and other caves both of the United States and Europe, differs from the outdoor form in its antennæ and abdominal appendages being greatly exaggerated in length. The cave crickets have eyes, but they do not extend into the remoter parts of the cave, and hence are twilight species, and probably cross with other twilight individuals. Besides these, there are many eyeless crustacea of different groups—mites, myriapods, primitive wingless insects, a few flies, worms, and infusoria which go to make up this assemblage of sightless troglodytes.

Origin and History. The fauna of caves is evidently composed of the descendants of individuals which have been carried by various means into the subterranean passages, have become adapted to life in perpetual darkness, becoming isolated, and thus, so long as they are subjected to their peculiar environment, breed true to their species, and show no tendency to relapse to their originally eyed condition. There are, moreover, many blind or eyeless animals, fishes, insects, and crustacea which live in holes, ant nests, or in the abysses of the ocean, which, from the same general cause, i.e., absence of the stimulus of light, have become eyeless and otherwise modified in compensation for the loss of vision.

The fauna of caves is indeed a most simple and intelligible object lesson in establishing the truth of the evolution theory and the doctrine of use inheritance. Lamarck, in 1809, cited the cases of the mole and burrowing sphalax, as well as the *Proteus* of Austrian caves, as examples of the impoverishment and disappearance of these organs through constant lack of exercise. Darwin candidly admitted that natural selection did not operate in the case of cave animals, but that the loss of eyes was due to disuse.

Indeed, the main interest in studies of cave life centres in the obvious bearing of the facts on the theory of descent. The conditions of existence in caverns, subterranean streams, and deep wells are so marked and unlike those which environ the great majority of organisms, that their effects on the animals which have been able to adapt themselves to such conditions at once arrest the attention of the observer.

It is obvious that the action of the Lamarckian or primary factors of organic evolution, i.e., change in the environment and use and disuse, are amply sufficient, when coupled with isolation and heredity, and that form of it called "use inheritance," to produce the blind forms. Here, also, we have a case where the transmission by heredity of eyes adapted for vision lapses, owing to the profound change of en-

vironment, and the animals, after becoming adapted to a life in total darkness, inherit the degenerate eyes as well as the specialized tactile organs, elongated appendages, etc., acquired by the modified organisms—a clear example of the transmission of acquired characters. The absence of the stimulus of light causes the eye, through disuse, to undergo reduction and atrophy. With this goes, in certain forms, the loss of the optic ganglia and optic nerves. Packard has found and stated the following effects of disuse in the invertebrate animals of Mammoth and other caves, and it will be realized how profoundly the organisms have been modified:

1. Total atrophy of optic lobes and optic nerves, with or without the persistence in part of the pigment or retina and the crystalline lens (certain crustacea, harvestmen, *Adelops* beetle, and the myriapod *Pseudotremia*).

2. Persistence of the optic lobes and optic nerves, but total atrophy of the rods and cones, retina (pigment), and facets (blind crayfish).

3. Total atrophy of the optic lobes, optic nerves, and all the optic elements, including rods and cones, retina (pigment) and facets (*Anophthalmus* beetle and the myriapod *Scotterpes*).

An interesting fact, confirmatory of the theory of occasional rapid evolution, as opposed to invariably slow action involved in pure Darwinism, is that we never find any vestiges of the optic lobes or optic nerves; if they are wanting at all, they are totally abolished. The atrophy is comparatively rapid, sudden, and wholesale. It was probably so with the loss by disuse of the thumb of the thumbless monkey of South America, which has retained no vestige of the lost member.

The varying degrees of development in the external parts of certain blind animals prove that these forms entered the caves at different periods and have been exposed for different lengths of time to the loss of light. The completely eyeless forms are the oldest inhabitants of these regions of Cimmerian darkness. The imperfect lenses and retine, the abolishment of visual nerves and portions of the brain, are, like all vestigial structures in highly specialized or modified animals of various kinds, like ancient, decayed signposts pointing out some nearly obliterated paths now unworn and disused.

On the other hand, certain other parts of the body, as the result of use, become extraordinarily developed; such are the tactile papillæ of the blind fish, the greatly lengthened feelers and legs, the long, delicate tactile hairs of various crustacea and insects. It is plainly the case that the enhanced development of these organs is the result of frequent use or exercise. There is no need of invoking natural selection, these parts developing as the direct result of the change of habits, of the new needs of the animals to feel their way about, forced to adopt such habits by the abnormal conditions of their existence. Although the animals are members of very different groups, inheriting very different structures and habits, yet all genuine cave animals resemble each other in being pale, ghost-like, in the exaltation of the tactile sense, and the corresponding increase in length and delicacy of the extremities.

Yet some naturalists of the Neo-Darwinian school reject the operation of the Lamarckian factors and rather illogically attribute the cre-

ation of this wonderful assemblage of blind forms to natural selection, and others to panmixia, i.e., the cessation of natural selection.

Balance of Theories.—In his elaborate work on the eyes of blind fishes Eigenmann fully and candidly discusses the conflicting views, and concludes as follows: "The Lamarckian view, that through disuse the organ is diminished during the life of the individual, in part at least on account of the diminution of the amount of blood going to a resting organ, and that this effect is transmitted to succeeding generations, not only would theoretically account for unlimited progressive degeneration, but is the only view so far examined that does not on the face of it present serious objections."

It would be a thorough test of the theory of descent if we could keep these creatures in confinement, exposed first to twilight and then to the full light of day, and endeavor to breed a series of generations of these blind animals and ascertain whether their descendants would not revert to their original ancestral eyed forms.

Fortunately an underground laboratory for the study of cave animals has been established by M. Viré in the old catacombs and underground quarries extending under the Jardin des Plantes in Paris. Here are all the conditions of a cave, viz., perpetual darkness, an unvarying temperature, and running water for aquatic forms. M. Viré has introduced various blind or eyed species, and eventually we may expect to have much light thrown on the interesting problems suggested by such studies as these.

Great activity has been shown in France in the exploration of the caves and subterranean streams of the Midi. A Société de Spéléologie has been organized for several years.

Consult: A. S. Packard, "The Cave Fauna of North America," *Memoirs National Academy of Sciences*, vol. vi, many plates (Washington, 1888); C. H. Eigenmann, "The Eyes of the Blind Vertebrates of North America" (*Archiv für Entwicklungsmechanik der Organismen*, viii, 1899); and especially the same author's "Cave Vertebrates of America" (*Carnegie Institution*, Washington, 1909). Consult also the writings of Tellkamp, Schiötte, Cope, Putnam, Garman, Henshaw, Joseph, Chilton, and others.

CAVEAT (Lat., let him beware, from *cavere*, to take heed). A formal notice addressed to a judicial or administrative officer, warning him not to take certain proceedings, which may or may not be in contemplation, without first giving due notice to the person filing the caveat. The object of the notification is to secure to the person giving it an opportunity to be heard in opposition to the action or proceeding in question, and it operates as a stay upon such proceeding. Caveats are available in England for a variety of purposes, as to restrain the enrollment of a decree in chancery, the issuing of a lunacy commission, the grant of a marriage license, the probate of a will, etc. In the United States they are not so common, though they may in some States be employed for some of these purposes, especially to stay the probate of wills and the issuing of letters testamentary.

In this country, till 1910, the term was employed in connection with proceedings for securing patents for inventions. The laws regulating the granting of patents provided that a caveat might be filed by an inventor to give notice to the Patent Office of inchoate inventions. Such a caveat set forth the purpose of the inven-

tion or discovery, and its distinguishing characteristics, and prayed protection of the inventor's right until he should have matured his invention. It was required to be filed in the confidential archives of the office and to be preserved in secrecy, and it had to be renewed from year to year in order to be kept in force. The person filing it was entitled to be notified of any application for a patent made during the lifetime of the caveat, which application, if granted, would interfere with the invention claimed therein, and was entitled to priority by reason thereof. Consult: *Rules of United States Patent Office*; Merwin, *Patentability of Inventions* (Boston, 1883); Luby, *Patent Office Practice* (Kalamazoo, 1897). See PATENT.

CAVEAT EMPTOR (Lat., let the buyer beware). A common-law maxim signifying that the purchaser of land or goods takes his chances as to the title or the quality of the property acquired by him. There is great difference of opinion as to the extent to which this maxim really represents the law. A learned English judge expressed the opinion, in 1849, that "the result of the older authorities is that there is by the law of England no warranty of title in the actual contract of sale, any more than there is of quality." A few years later an equally learned judge declared that "the only semblance of authority for this doctrine from the time of Noy and Lord Coke consists of mere dicta." The application of the doctrine to title to chattels has been done away with in England by the Sale of Goods Act, 1893 (56-57 Vict., c. 71), by which the law relating to the sale of goods was codified, while in the United States this application of the doctrine has never had any judicial sanction, so far as the sale of personal property is concerned. The mere act of A's selling property to B amounts to an undertaking on his part that the title was in him. B does not buy at his peril. It is the seller, not the buyer, who must take care of the title. However, the maxim "Caveat emptor" does apply to sales of land. In the absence of fraud or of covenant as to title by the vendor, the vendee buys at his peril.

With respect to the quality of chattels, the common-law maxim "Caveat emptor" still applies, although its scope has been narrowed greatly during the last 100 years. Indeed, an eminent judge has declared that the exceptions have well-nigh eaten up the rule. By the English Sale of Goods Act referred to above, the civil-law rule "Caveat venditor" (let the seller beware) is in many cases substituted for "Caveat emptor." For example, if the buyer notifies the seller that the goods for which he is treating are required for a special purpose, and that he relies on the seller's skill or judgment, and the goods are of a description which it is in the course of the seller's business to supply, the seller impliedly engages that they shall be reasonably fit for such purpose. Again a person who sells goods by description or sample impliedly engages that they shall correspond with the description or sample and shall be of a merchantable quality. While neither legislation nor judicial decisions in the United States accord entirely with the provisions of the English statute, their tendency is towards the same goal.

In Rome the rule of early law was, in effect, "Caveat emptor." With the growth of commerce, however the inadequacy and injustice

of this rule became apparent, and it was modified from time to time by edict and by the reasoning of jurists, until it was transformed into "Caveat venditor." This maxim of primitive law has been undergoing a similar modification in England and in the United States during the last century. Consult the authorities referred to under SALE; TITLE; WARRANTY.

CAVE BEAR. See BEAR.

CAVE DWELLERS. A general term, usually, but loosely, applied to a largely hypothetical class of troglodytes, or primeval inhabitants of given countries or of the world. The most decisive evidences of cave life by early man are derived from western Europe, both continental and insular, where human remains and artifacts are found in certain caverns associated with bones and teeth of various extinct animals, including the cave bear, the sabre-toothed tiger, etc., as well as of animals no longer occupying the same habitat, such as the reindeer, hyena, etc. Such remains are frequently found in a distinctive earthy deposit ("red cave earth") beneath a floor of stalagmite. The sequence of deposits and the character of the fossils attest great antiquity, probably antedating the later Glacial periods of the Pleistocene. Several of the most instructive examples of early prehistoric man (Man of Spy, Man of Cro-Magnon, Man of Mentone, etc.) may be regarded as representing the period of European cave dwellers. In various parts of the world, notably in Asia and southeastern Europe, are found habitations excavated in cañon walls or other precipices; the rock-hewn tombs at Petra, in northern Arabia, are plausibly supposed to have been designed as places of residence; in China and Mongolia whole villages are excavated in bluffs of loess, as noted by Pumpelly and others; but nowhere do mankind now occupy natural caves as permanent habitations, so far as known. Many of the American races temporarily occupied natural shelves or niches in precipices ("rock houses," as they are sometimes called), and some inclosed these with walls of masonry or other material to form permanent cliff dwellings, while others excavated the cliff faces to form cavate lodges (see CLIFF DWELLERS); it is known, too, that individuals and families, or even small bands, found temporary refuge in caverns; yet the term "cave dwellers" is inapplicable in America, either as a specific designation for any people or period or as a descriptive term. The general tendency of recent researches is to show that primeval men were arboreal and orarian, i.e., forest rangers and shore dwellers, rather than cave dwellers, and that cave life was secondary and due to peculiar conditions rather than primary and characteristic.

CAVELIER, kă'v'lyă', **PIERRE JULES** (1814-94). A French sculptor. He was born in Paris, studied under David d'Angers and Delacroix, and first gained celebrity in 1849 by a statue of "Penelope" (Château d'Amboise), for which he received the medal of honor. Although he is no great original genius, his sculpture shows careful execution, a harmonious style, and the strong influence of classical sculpture. Among his best works are numerous decorative figures on the exterior of the Louvre; "Labor" and "Happiness," in the Hôtel de Ville; "St. Remy," Panthéon; the statue of Gluck, Opera House; "St. Matthew," portal of Notre Dame; "Truth," "The Mother of the Gracchi," and "The

Neophyte," in the Luxembourg. He was appointed professor at the Beaux-Arts in 1864 and member of the Institute in 1865. Among his numerous pupils were Barrias, Desbois, and Charpentier.

CAVELIER DE CUVERVILLE, də ku'vēr'vêl', **JULES MARIE ARMAND** (1834-1904). A French naval officer. He was born near Alleneuc, Côtes-du-Nord, and studied in Rennes and in Paris. He took part in the Crimean campaign, was professor at the Naval Academy from 1861 to 1863, naval attaché of the French Embassy at London, and commander of the naval division in the southern Atlantic. After his promotion to the rank of rear admiral in 1888 he was, in 1890, intrusted with the chief command of the Atlantic squadron, in which capacity he terminated the affair with Dahomey and signed a treaty of peace with the King of that country. His contributions to naval literature include: *Le canon de quinze pouces des Etats-Unis* (1866); *Progrès réalisés par l'artillerie navale de 1855 à 1890* (1891); *La marine aux Etats-Unis* (1867).

CAVELL, EDITH. See VOLUME XXIV.

CAVE MAN. See CAVE; CAVE DWELLERS.

CA'VEN, WILLIAM (1830-1904). A Canadian Presbyterian divine. He was born at Kirkecolm in Wigtownshire, Scotland, Dec. 26, 1830, graduated at the theological seminary of the United Presbyterian Church, Toronto, Canada, 1852, entered the ministry, became professor of exegetical theology and biblical criticism, Knox College, Toronto, 1866, and principal of the college, 1873. He was prominent in the movement which led to the union of the different branches of the Presbyterian church in Canada.

CAVENDISH, kăv'en-dish or kân'dish. The pseudonym of Henry Jones, who wrote on whist and other games of cards.

CAVENDISH, FREDERICK CHARLES, LORD (1836-82). An English statesman, the second son of William Cavendish, seventh Duke of Devonshire. He was born at Eastbourne, graduated at Cambridge in 1858, was private secretary to Lord Granville from 1859 to 1864, and entered Parliament in 1865. After serving as private secretary to Mr. Gladstone (1872-73) he entered the Treasury Department, in which he was Financial Secretary from 1880 to 1882, when he was appointed chief secretary to Earl Spencer, Lord Lieutenant of Ireland. He accompanied the latter to Dublin, and took the oath as chief secretary at the castle, May 6, 1882. On the afternoon of the same day, while walking in Phoenix Park with Thomas Henry Burke, Undersecretary, he and his companion were assassinated. It was afterward shown that the plot had been laid against Mr. Burke, and that Cavendish was killed because he was in the company of the Undersecretary. Three of the conspirators turned state's evidence, five were hanged, and 17 were otherwise punished.

CAVENDISH, can'dish, **GEORGE** (1500-c.1561). An English author, the biographer of Cardinal Wolsey. In 1526 he entered the service of Wolsey and remained his constant friend, in prosperity and adversity, until the end. His *Life of Wolsey* is one of the most interesting books of the time. It was written in 1557 and was first published, in a garbled state, in 1641. The full text first appeared (a small edition) in 1761, and again in 1815, but not until 1905 (Boston) did it appear in a suitable form.

CAVENDISH, HENRY (1731-1810). An English natural philosopher and chemist. He was born in Nice, the eldest son of Lord Charles Cavendish and a nephew of the third Duke of Devonshire. He was educated at Peterhouse College, Cambridge, but left without taking his degree, and devoted his entire life to the study of mathematics and physical science. He inherited considerable means from his uncle and was thus able to gratify his taste for scientific investigation. He was unmarried and lived in quiet retirement, having intercourse with few persons, and having no interests beyond his scientific studies and investigations. His first published work was entitled *Experiments on Arsenic* (1764), but his earliest experiments of interest were on heat and were not published for a number of years after they were performed. These experiments included the study of the evolution of heat when a liquid is solidified or a gas condensed, as well as an investigation into the subject of specific heats of substances.

The first scientific paper of importance published by Cavendish was on *Facitious Air*, and was communicated to the Royal Society in 1766, while later he undertook the study of carbonic acid gas, determining its specific gravity and showing that a small amount would so vitiate common air as to make it impossible to support either combustion or life. The most celebrated work of Cavendish was his ascertaining "that water consists of dephlogisticated air (oxygen) united with phlogiston (hydrogen)." One of the most celebrated of the experiments performed by Cavendish was the determination of the density of the earth (*Philosophical Transactions*, 1798), by a method to which his name has been given. This plan had been suggested by the Rev. John Mitchell and consisted of having a suspended rod with two lead balls at its extremities. When masses of metal were placed near these balls, the force of attraction exerted between the masses could be measured. Accordingly it was possible to compute the attraction exerted on a mass the size of the earth and thus determine its density. Cavendish ascertained this quantity to be 5.45, a figure that has been slightly raised by subsequent experiments. Cavendish lived almost in solitude, and died leaving a fortune of £1,175,000. *The Electrical Researches of Henry Cavendish*, ed. by J. Clerk-Maxwell, were published (Cambridge, England, 1879). Consult Wilson, *Life of Cavendish* (London, 1846). See CHEMISTRY.

CAVENDISH, MARGARET, DUCHESS OF NEWCASTLE (c.1624-74). An English writer, born near Colchester in Essex. She was educated at home; became a maid of honor to Queen Henrietta Maria (1643-45); married, in Paris, William Cavendish, afterward Duke of Newcastle (1645), and lived abroad with him till the Restoration. She died in London and was buried in Westminster Abbey. The famous inscription on her tomb declares that she belonged to a family of which "all the brothers were valiant and all the sisters virtuous." Her writings, consisting of plays, poems, sketches, letters, an autobiography, and a memoir of her husband, are exceedingly interesting. *Selections* were edited by Lower, in *Smith's Library of Old Authors* (London, 1872), by Jenkins (London, 1872), and by C. H. Firth (London, 1886). Consult also C. H. Firth, *The Life of William Cavendish, Duke of Newcastle; to which is added The Life of Margaret, Duchess of Newcastle*

(London, 1886); and Gosse, *Seventeenth Century Studies* (London, 1895).

CAVENDISH, SPENCER COMPTON. See DEVONSHIRE, SPENCER COMPTON CAVENDISH.

CAVENDISH, THOMAS (c.1555-92). The second English circumnavigator of the globe and a noted freebooter. He was born in the parish of Trimlay St. Martin, Suffolk, studied for a brief period at Cambridge, but left without a degree, followed the court, and soon squandered his inheritance. To repair his fortunes he turned to maritime adventure and fitted out a ship that accompanied Sir Richard Grenville's expedition to Virginia in 1585. On this voyage he captured three rich Spanish ships. In July, 1586, he sailed from Plymouth with three vessels on a predatory expedition, passed through the Straits of Magellan, cruised along the west coast of South America and Mexico, and burned or sank 19 vessels, among which was the *Santa Anna*, belonging to the King of Spain and having an immensely valuable cargo, which he seized off California. He returned to Plymouth Sept. 9, 1588, with his plunder, having gone around the globe in two years and 50 days. When he came home, it was said that his seamen were clothed in silk, his sails were of damask, and his topmast was covered with cloth of gold. Within three years he wasted his wealth, and, accompanied by John Davis, started upon another voyage. The venture was a failure, and Cavendish died on the way home. Accounts of all three voyages are to be found in Hakluyt.

CAVENDISH, SIR WILLIAM (1505-57). An English courtier. He was a younger brother of George Cavendish, Cardinal Wolsey's biographer, with whom he is often confused. He enjoyed the favor of Henry VIII, who in 1530 appointed him one of the commissioners to seize monasteries for the crown, by which he added greatly to his wealth. In 1546 he was made treasurer of the King's chamber, was knighted, and became a Privy Councillor. Both Henry and Edward VI largely increased his landed property by grants of monastic estates. Conforming under Mary, he also received rewards from her. His great property became the foundation of the immense estates of the dukes of Devonshire.

CAVENDISH, WILLIAM, DUKE OF NEWCASTLE (1592-1676). An English statesman and author. He was the son of Sir Charles Cavendish, younger brother of the first Earl of Devonshire, and was educated at St. John's College, Cambridge. His accomplishments and bearing gained him the favor of James I, who in 1610 made him a knight of the Bath, and in 1620 raised him to the peerage as Viscount Mansfield. In 1628 he was created Earl of Newcastle by Charles I, and on the royal visit to Scotland entertained the monarch with two banquets of historical repute, at a cost of £20,000. In 1638 the King intrusted him with the tuition of his son, afterward Charles II. He munificently supported the King during the Civil War and raised a troop of 200 knights, who served at their own cost. As general of the northern forces, he had the power to issue declarations, confer knighthood, coin money, and raise men. After the battle of Marston Moor, Cavendish retired to the Continent, where he resided in poverty until the Restoration. On his return he was created Duke of Newcastle. He wrote poems, plays, and veterinary works. *La méthode et invention nouvelle de dresser les chevaux*

(Antwerp, 1657) was written in English, translated by a Walloon, and published in French; afterward it was amplified as *A New Method and Extraordinary Invention to Dress Horses and Work Them According to Nature, etc.* (London, 1667). He was a skillful horse trainer and made an accomplished horseman of his pupil, Charles II. He died Dec. 25, 1676. Consult *Life of the Duke of Newcastle*, by his second wife, Margaret Lucas (London, 1667; new ed. by C. H. Firth, London, 1886). This work is ridiculed by Pepys in his *Diary*, March 18, 1668.

CAVENDISH COLLEGE. A college founded in 1873 by the County College Association of Cambridge University, England, in order to enable undergraduates to pass through a university course at the least possible cost of money and time and to make a specialty of the art of teaching. The present buildings of the college were begun in 1876. There were in 1890 about 33 students in residence. It was closed the following year and is at present a Nonconformist training college and, of course, not connected with the university.

CAVE OF ADULLAM. See ADULLAM, CAVE OF.

CAVE OF MACHPELAH, māk-pē'lā. See MACHPELAH, CAVE OF.

CAVE OF THE NATIVITY. The supposed birthplace of Christ, a winding cave in Bethlehem, beneath the Church of the Nativity, built over it by the Empress Helena and the Emperor Constantine. The position of the manger and the precise spot where Christ was born are marked. The grotto is beautified with marbles and candles are constantly burning.

CAVE OF THE WINDS. See NIAGARA FALLS.

CAVE OF TROPHONIUS. See TROPHONIUS.

CAVE PAINTINGS. See PALEOLITHIC PERIOD.

CAVERNE DE L'HOMME MORT, kā-věrn' de lôm mōr (Fr., cavern of the dead man). A cave in the Department of Lozère, France, in which skeletons of a prehistoric race have been discovered.

CAVETTO (It., dim. of *cavo*, hollow, from Lat. *cavus*, hollow, Gk. *kāp*, *kyar*, hole, from Gk. *kveiv*, *kyein*, to swell, to contain). In architecture, a simple concave molding, to be distinguished from the scotia because it is only a quarter round, whereas the scotia's curve embraces at least the half of a circle or ellipse.

CAVIANA, kā-vyā'nā. An island of Brazil, lying across the main mouth of the river Amazon. It is about 35 miles long by 20 wide, fertile, and well stocked with cattle (Map: Brazil, H 3). The little town of the Roberdello, on the southeast coast of the island, is almost exactly under the equator.

CAVIAR, kāv'ī-ār, or **CAVIARE** (Fr., from Turk. *hāvyār*, caviar, probably of Tatar origin). The roe of a sturgeon prepared as a piquant table delicacy, especially in Russia. (For the various sturgeons, see STURGEON.) The process of making caviar is as follows: The ovaries, having been removed from the fish, are beaten to loosen the eggs, which are then separated from the muscular tissue by being pressed through a sieve. The liquor is then pressed out, salt is well mixed in, and the whole packed in small kegs. The quality of the result depends upon the care in clearing and drying it. The best is

prepared by granulating the roe in linen sacks, which are laid in the brine and then hung up in the sun to dry. The Russian caviar comes principally from the neighborhood of the Caspian Sea; but caviar is prepared in the Danube provinces and elsewhere, and lately has been made extensively in the western United States.

CAVITE, kā-vě'tā. The capital of the Province of Cavite, and the naval headquarters of the archipelago in Luzon, Philippines, on Manila Bay, about 8 miles southwest of Manila (Map: Luzon Island, E 8). It is built of stone, and has a theatre and several government buildings of note. The leading industrial establishment is a large tobacco factory. During the Spanish administration Cavite was one of the principal strongholds in the archipelago, and since the Spanish-American War has been made even stronger. There are an arsenal, well-equipped repair shops, and good docking facilities. Pop., 1903, 4494.

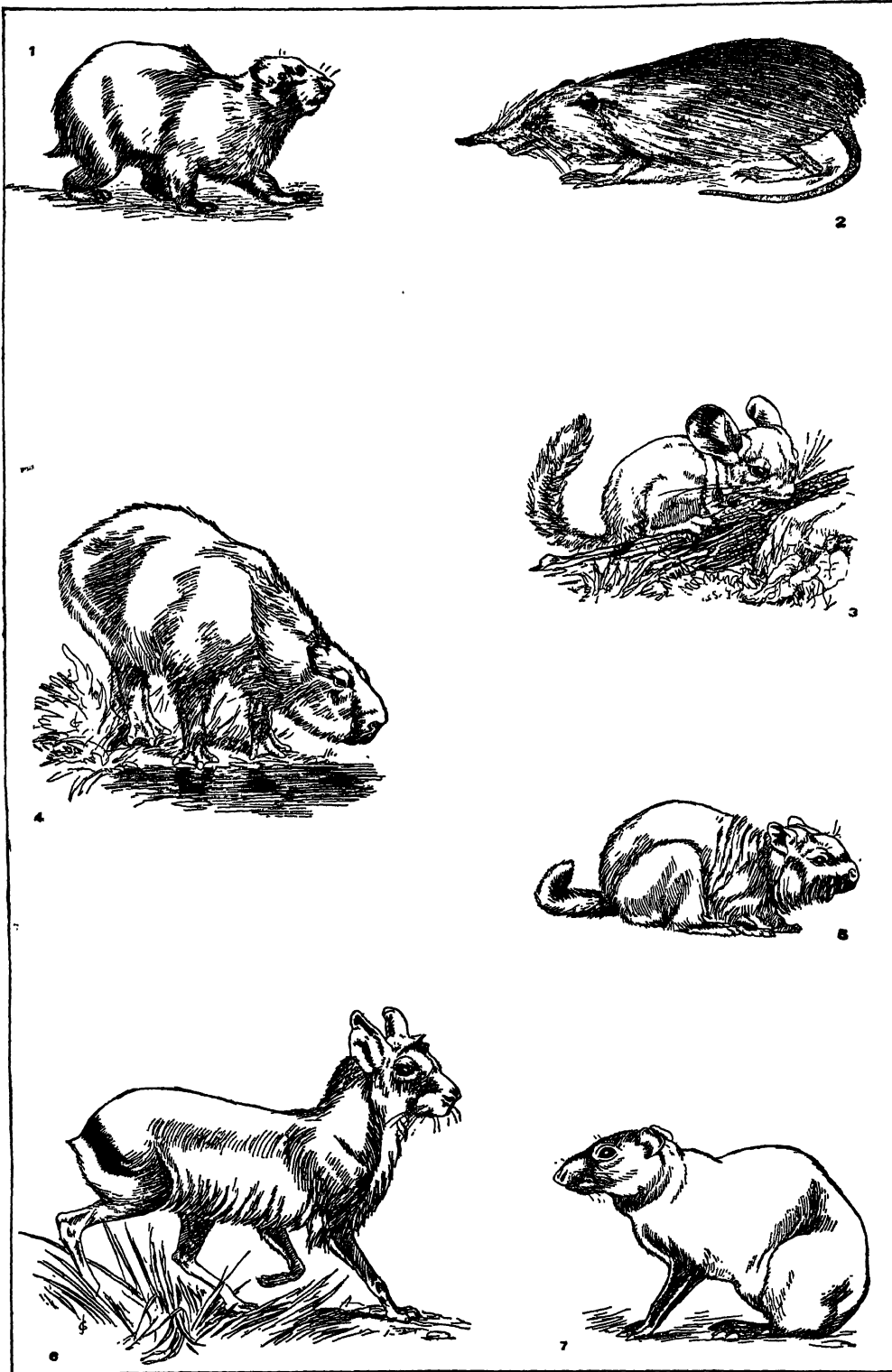
CAVITE. A province of Luzon, Philippines, south of the Province of Manila, and bounded by Manila Bay on the west (Map: Luzon, E 9). It covers, with its dependent islands (100 sq. m.), an area of 610 square miles. It has wooded mountains and well-watered valleys and is of commercial importance on account of its advantageous situation. Rice, sugar, and coffee are grown extensively, and grazing is an important occupation. Fine fruit abounds throughout the province. The only manufactures of importance are sugar and hemp and cotton cloth. Pop., 1903, 134,779.

CAVO, kā'vō, ANDRÉS (1739-c.1800). A Mexican Jesuit historian, born in Guadalajara. He entered the Jesuit Order in 1759 and was sent as a missionary to the Northwest. In 1767 he was compelled to leave Mexico by the decree of Charles III expelling the Jesuits. He prepared in Rome a work on Mexican history, which remained inedited until recovered by C. M. Bustamante, who published it as *Los tres siglos de Méjico durante el gobierno español* (1836). H. H. Bancroft, in his *History of Mexico*, gives a favorable estimate of the narrative as such, and of its general historic spirit, although recognizing its strongly anti-Spanish leaning.

CAVO-RILIEVO, kā'vō-rē-lyā'vō (It. *cavo*, hollow + *rilievo*, relief). A kind of depressed bas-relief, in which the carving is sunk below the level of the surface of the background. It was used extensively by the Egyptian wall decorators. It makes possible the execution of sculptured wall panels after erection of a building in stone or marble, without the trouble of leaving bossed spaces in course of construction.

CAVOUR, kā-vōor', CAMILLO BENSO DI, COUNT (1810-61). The great constructive statesman of modern Italy. He was born in Turin, Aug. 10, 1810, the son of the Marquis Michele Benso di Cavour and Adèle, second daughter of the Count de Sellon of Geneva. As a younger son, Camillo was educated for the army in the military academy in Turin, serving at the same time as a page in the royal household of King Charles Albert. After graduating at the head of his class in 1826, he entered the army as a lieutenant of engineers. Even at this early period he showed the earnestness, concentration, and ability which made the brilliant statesman of later years. He was proficient in the study of mathematics, the languages, and history. His mind was extremely practical, and he never cared for art or romance. He had no taste for

CAVIES, ETC.



1. JAMAICAN SHORT-TAILED HUTIA (*Capromys brachyurus*).
2. SOLENODON (*Solenodon cubanas*).
3. CHINCHILLA (*Chinchilla lanigera*).

4. CARPINCHO or CAPYBARA (*Hydrochoerus capybara*).
5. VIZCACHA (*Lagostomus trichodactylus*).
6. PATAGONIAN CAVY (*Dolichotis patachonica*).
7. AGOUTI (*Dasyprocta aguti*).

food for both man and beast throughout the plains and unforested highlands of that continent. The largest species (*Cavia patchonica*), sometimes called "agouti," formerly spread throughout the plains of all Argentina, but now nearly extinct, resembles a hare standing upon terrier-like legs; it is a foot in height, and rusty red in general color. It digs deep burrows of its own and also occupies those of the viscacha. The restless cavy (*Cavia porcellus*), or "aperea," and Cutler's cavy (*Cavia cutleri*) are common in burrowing colonies in the La Plata valley and seem to be the ancestors of the guinea pig, though uniformly colored—the former grayish brown, the latter nearly black. Other species inhabit rocky places to a considerable altitude in Brazil and Bolivia. Consult Hudson, *Naturalist in La Plata* (London, 1892). See GUINEA PIG, and Plate of CAVIES, ETC.

CAWDOR, kə'dēr. A parish in county Nairn, Scotland, 10 miles east by north of Inverness, noted as the site of Cawdor Castle, in which Shakespeare places the murder of Duncan by Macbeth. Pop., 1901, 925; 1911, 847. During the rebellion of 1745 Lord Lovat was, according to tradition, for a time concealed in this castle. It is in an excellent state of preservation and presents a fine specimen of a true baronial stronghold of feudal times.

CAWDOR, THANE OF. A character in Shakespeare's *Macbeth*, who does not appear on the stage, but whose title is coveted by Macbeth and secured by his causing him to be executed for treason. The description of the character, especially as to his bearing at the hour of death, has led Shakespearean editors to find here a reference on the part of the author to the unfortunate Earl of Essex.

CAWEIN, kə-wīn', MADISON JULIUS (1865–1914). A prolific American poet, born and educated in Louisville, Ky. He is the author of, among other books, *Blooms of the Berry* (1887); *The Triumph of Music* (1888); *Lyrics and Idyls* (1890); *Moods and Memories* (1892); *Poems of Nature and Love* (1893); *The Garden of Dreams* (1896); *Shapes and Shadows* (1898); *One Day and Another* (1901); *Kentucky Poems* (1902); *Complete Poetical Works* (5 vols., 1907); *New Poems* (1909); *The Shadow Garden*, etc. (plays, 1910); *Poems* (1911); *The Republic* (1913). A selection of his poems has been made by him, with a brief introduction by W. D. Howells.

CAWNPORE, kən-pōr', or **CAWNPUR**, kən-pōor', or **KANPUR** (Hind. *Kanhpur*, city of Krishna, from *kanh*, Skt. *kṛṣṇa*, *krishna*, black + *pur*, Skt. *pura*, city). A city, capital of a district of the same name in the Allahabad division of the United Provinces, British India, on the right bank of the Ganges, 140 miles above Allahabad (Map: India, D 3). Cawnpore's modern importance is due to its commercial facilities and partly to military and political considerations. Since 1888 it has been brought into direct communication with Bombay, through the opening of the railway to Jhansi, and, at the junction of four lines, it is one of the chief railway stations in India. It has an extensive trade in grain and agricultural produce, and important manufactures of home commodities, such as cotton, leather, harness, woodenware, sugar, jute, iron products, chemicals, and cabinetwork. The town contains mission churches, schools, zenanas, a club, and good hotels. It owns municipal water works. It has

belonged to the English since 1801. The name of Cawnpore is associated with the events of the Sepoy Mutiny, one of the most terrible episodes of which was enacted here in July, 1857, the massacre of the European women and children by Nana Sahib. A prominent feature of Cawnpore is the memorial garden, covering the scene of the massacre. Marochetti's angel in white marble, under the Gothic monument over the well in which the dead and dying were cast, is a superb piece of sculpture. Though Cawnpore is only 379 feet above the sea, yet during winter considerable quantities of ice are made for preservation, by exposing water in shallow vessels at night. Pop., 1891, 163,800; 1901, 202,797; 1911, 175,557. Area of district, 12,384 square miles. Pop., 1891, 1,209,695; 1901, 1,258,868; 1911, 1,142,286. Consult Trevelyan, *Cawnpore* (London, 1865).

CAXAMARCA, kə'hā-mär'kā. See CAJAMARCA.

CAXIAS, kə'shē-āsh'. A town in Brazil, situated in the State of Maranhão (Map: Brazil, J 5), on the river Itapicuru, about 200 miles southeast of Maranhão. It has a large trade in cattle, rice, and cotton, the river being navigable. It is the birthplace of the poet Luis Gonçalves Dias. Pop., about 10,000.

CAXIAS, LUIZ ALVES DE LIMA E SILVA, DUKE OF (1803–80). A Brazilian general and statesman. He was born in Rio de Janeiro and entered the army at the age of 12. After a brilliant military experience, he was in 1850 appointed Minister of War and President of the Council, and afterward, as commander in chief of the Brazilian army, he conducted the war against Argentina, 1851–52. In this war he earned his title as Marquis. In 1867–69 he stood in the forefront of the war against Paraguay and captured its capital, Asunción. The state of his health after this laborious undertaking was such that he had to retire at once to Montevideo. The Emperor Dom Pedro I, as a reward for his services as Minister and general, created him Duke (the only title of this nature that was ever conferred upon a Brazilian) and presented him with the Grand Cross of the Order of Pedro I. From 1875 to 1878 he was again President of the Council and Minister of War.

CAXIAS, MARQUES AND DUKE OF. See LIMA E SILVA, LUIZ ALVES DE.

CAXTON, WILLIAM (c.1422–91). The first English printer. He was born in the Weald of Kent, and the particulars of his life are scanty. He was apprenticed in 1438 to Robert Large, a wealthy London mercer. At the death of the latter, in 1441, he went to Bruges, where from 1462 to 1470 he was governor of a chartered association of English adventurers trading in foreign lands. In 1471 Caxton entered the service of Margaret, Duchess of Burgundy, formerly an English princess; and, apparently towards the end of 1476, he set up his wooden printing press at the Sign of the Red Pale, in the Almonry, at Westminster. The art of printing he had acquired while abroad, either at Cologne or at Bruges, more likely at the latter place, from Colard Mansion, a well-known printer of that city; and in 1474 he put through the press (without much doubt Mansion's) the first book printed in English, the *Recuyell of the Historyes of Troye*, a translation of Raoul de Fèvre's work. The *Game and Playe of the Chesse* (probably 1475) was another of Caxton's earliest publications; but the *Dictes and No-*

table Wise Sayings of the Philosophers (published Nov. 18, 1477) is the first book which can with certainty be maintained to have been printed in England. All the six fonts of type from which Caxton printed may be called black letter. Of the 99 known distinct productions of Caxton's press, no fewer than 38 survive in single copies or in fragments only. Caxton, who was an accomplished linguist and translated many of the works that issued from his press, was diligent in the exercise of his craft or in translation until within a few hours of his death, which occurred in 1491. By his numerous translations he helped fix the English speech and his many books prepared the way for the literary efflorescence of the Elizabethan era. In 1877 the great printer and his work were fittingly commemorated by a typographical exhibition in London. Consult: Knight, *The Old Printer and Modern Press* (London, 1861); Blades, *Life and Typography of William Caxton* (London, 1861-63), *A Catalogue of Books Printed by or Ascribed to . . . William Caxton* (London, 1865); *Biography and Typography of Caxton* (London, 1882). See, too, in *Cambridge History of English Literature* (Cambridge and New York, 1907-13), two excellent studies in vol. ii: Duff, "Introduction of Printing into England and the Early Work of the Press"; and Greenwood, "English Prose in the Fifteenth Century." The publications of the Caxton Club may be consulted to advantage.

CAXTON MEMORIAL BIBLE. See BIBLE, CURIOUS EDITIONS OF.

CAXTONS, THE. A novel by Bulwer Lytton, published in 1850 (3 vols. octavo). It was originally published in *Blackwood's Magazine*. The scene is chiefly laid in the midst of English country life, and the interest consists largely in the conversations which are held between the members of the Caxton family. Pisistratus Caxton, the *ego* of the story, also appears in *My Novel* and other later works of the author.

CAXTON SOCIETY. An association formed in London, in 1845, for the purpose of publishing mediæval chronicles and other works. Of these it issued 16 vols. before its dissolution in 1854.

CAYAMBÉ, *kā'yām-bā'*, or **CAYAMBÉ-URCU,** *ōōr'kōō*. A volcanic peak of the Andes, in Ecuador, about 60 miles east-northeast of Quito and almost directly under the equator (Map: Ecuador, B 3). It has an altitude of about 19,200 feet and is covered with perpetual snow.

CAYAPAS, *kā'ya-pās*. A tribe of the Barbacoan stock, residing on the coast, near Tola, in Ecuador. Von Buchwald has sought to identify them with the ancient Caras (q.v.). Consult Barrett, "The Cayapo Numeral System" in *Putnam Anniv.* Vol., pp. 395-404 (New York, 1909), and Beuchat and Rivet, *Affinités des langues du sud de la Colombie et du nord de l'Équateur* (Louvain, 1910).

CAYAPÓS, *kā'ya-pōs*. A tribe of Tapuyan stock, situated north of the Rio Pardo. See TAPUYAN.

CAYCOS, *kī'kōs*. See CAICOS.

CAYENNE, *kā-ēn'* or *kī-ēn'*. The capital of French Guiana (Map: Guiana, G 3). It is situated on an island of the same name in the Atlantic, in lat. 4° 56' N. and long. 52° 20' W. It has a well-protected though shallow harbor, several fine churches, two hospitals, a bank, and an ecclesiastical college. Cayenne is the only outlet for the products of French Guiana and

has direct steamer communication with France. The climate is moist, but not very unhealthful. There are about 13,000 inhabitants. Cayenne was founded in 1604 and became a French possession in 1875. It was formerly used as a penal settlement.

CAYENNE PEPPER. See CAPSICUM.

CAYES, *kā*. See AUX CAYES.

CAYEY, *kī-ā'*. A town of Porto Rico in the municipality of the same name, 37 miles south of San Juan (Map: Porto Rico, E 3). Situated at an altitude of 2300 feet, its cool climate and sanitary conditions make it a popular local summer resort. There are schools, a church, a hospital, and old Spanish barracks. The chief industry is the manufacture of excellent cigars. The tobacco raised in the surrounding country is of the best cultivated on the island. Pop., 1899, 3763; 1910, 4498.

CAYLEY, *kā'li*, ARTHUR (1821-95). An English mathematician. He was born at Richmond, Surrey, and was educated at King's College, London, and at Trinity College, Cambridge. In early life he devoted much time to the study and practice of law, being admitted to the bar in 1849, and some of his most brilliant mathematical discoveries were made during this period. Finally, in 1863, he left the legal profession to accept the Sadlerian professorship of mathematics at Cambridge. Cayley's most important contribution to mathematics is the theory of invariants. (See FORMS.) He also discovered an interesting higher curve, known as the Cayleyan, and the principal proposition of matrices, known as Cayley's Theorem. Many of his numerous memoirs were published in the *Cambridge Mathematical Journal*. His collected mathematical papers have been published in book form (13 vols. and supplement, Cambridge, 1889-98).

CAYLUS, *kā'lūs'*, ANNE CLAUDE PHILIPPE DE TUBIÈRES, COUNT DE (1692-1765). A French archæologist. He entered the army, served in the Spanish War of Succession, and after 1714 traveled in Italy, Greece, England, Germany, and the East, making collections of antiquities on which he published several learned works in French and Latin, the most important being the *Recueil d'antiquités égyptiennes, étrusques, grecques, romaines, et gauloises* (7 vols., Paris, 1752-67). He was a patron of art, and especially of engraving, which he himself practiced. In this field he wrote *Nouveaux sujets de peinture et de sculpture* (1755) and *Tableaux tirés de l'Iliade, de l'Odyssée et de l'Énéide* (1757). He claimed to have rediscovered the method of encaustic painting on wax mentioned by Pliny. He also wrote fiction, which has the kindly humor and attractive simplicity that characterized his own personality. His stories of Parisian life were collected together under the title *Œuvres badines complètes* (Amsterdam, 1787). Some of his stories were translated into English under the title "Oriental Tales" in Gueulette's *Chinese Tales* (1817). Consult: Rocheblave, *Essai sur le comte de Caylus* (Paris, 1889); Nisard's ed. of the *Correspondance du comte de Caylus avec le père Paciaudi* (1877); "Notice" of Uzanne in his *Facéties* (1879); and the preface of Jamet to the *Noëlion: conte allobroge d'après l'édition originale de 1747*, attributed to Caylus (Brussels, 1881).

CAYLUS, MARIE MARGUERITE LE VALOIS DE VILLETTE DE MURCAY, MARQUISE DE (1673-1729). A French court lady and author, mother of the

preceding. She was a descendant of the Protestant family of D'Aubigné, but was converted by her aunt, Madame Maintenon, to the Roman Catholic faith. She was one of the leaders of court society. Racine so admired her abilities that he wrote the prologue to his tragedy of *Esther* as a compliment to her. Her *Souvenirs*, full of interesting anecdotes of the court of Louis XIV, were edited by Voltaire (1770), and often since—notably by Raunié (1881).

CAYMAN, ká'man, or **CAIMAN** (Sp. *caiman*, from the Caribbean name). A native name applied loosely to various alligators, especially the South American, also called jacarés (q.v.). Most systematists now put *Alligator palpebrosus* and *Alligator trigonatus* into the genus *Cayman*, on account of the three thick bony plates which make their eye orbits stand out prominently, so that the former is called the eyebrowed cayman. Their habits are substantially the same as those of the common alligator (q.v.).

CAYMANS, kí-mánz'. A group of three low islets in the British West Indies 150 miles northwest of Jamaica, of which they are an administrative dependency governed by a commissioner (Map: Cuba, D 7). It consists of Grand Cayman (17 miles long and 4 to 7 miles broad), Little Cayman, and Cayman Brac, with a total area of 225 square miles. The chief town is Bodden town. The pasturage is good and the chief exports are coconuts, turtles, mahogany logs, and dyewood. Pop., 1901, 5287; 1911, 5564.

CAYUBABA, ká'yōō-bá'ba. A tribe constituting a distinct linguistic stock, now gathered into the mission of Exaltación, on Mamoré River, Bolivia. They are of good physique and are fine boatmen. In spite of Christianity, they have retained some of their strange primitive customs. A man does no work during his wife's menstrual period, neither will a widower undertake any important enterprise until he remarries. Consult Chamberlain in *Journal de la Société des Américanistes de Paris*, N. S., vol. vii, p. 182 (1910).

CAYUGA, ká-yōō'gá (N. Amer. Indian *Gwé-u-qweh-o-nó*, people of the mucky land). The smallest of the five tribes of the original Iroquois Confederacy. They formerly dwelt on Cayuga Lake, New York, but on the outbreak of the Revolution most of them, together with the Mohawks, joined the British side and removed to Canada, whence they never returned. They may number perhaps 1000 souls, of whom about 170 are living with the Senecas in New York, a few are with the Senecas in Indian Territory and the Oneidas in Wisconsin, while the main body is on the Six Nations Reserve on Grand River, Ontario. The name seems to refer to a cranberry swamp.

CAYUGA DUCK. See DUCK.

CAYUGA LAKE. A beautiful sheet of water in west central New York (Map: New York, D 3). It is 38 miles long, from 1 to 3½ miles wide, and enters Tompkins County, but lies between portions of Tompkins and Cayuga counties on the east and Seneca County on the west. It is 381 feet above tidewater, and 140 feet higher than Lake Ontario, into which it empties through the Seneca and Oswego rivers. At the north end the lake is shallow, but in other places reaches a depth of 400 feet. It is navigable for 30 miles. Along its clifflike banks are several thriving towns. Ithaca, near the south end of the lake, Aurora, near the middle of the east

shore, and Cayuga, near the north end, are the chief cities. The lake is much frequented by tourists and pleasure seekers.

CAYUSE, kí-'s'. A warlike tribe formerly occupying the Blue Mountain region, adjoining the Columbia River, in northwestern Oregon, and now gathered upon the Umatilla Reservation in the same country. In 1847 the smallpox, before unknown among them, carried off a large portion of the tribe, and, believing that it had been introduced by the missionaries, they attacked and destroyed Waiilatpu Mission, which had been established among them a few years before. They are now officially reported to number 298, most of them intermarried with other tribes, and only some half dozen individuals speak their own old language, which belongs to the Waiilatpuan stock. They acquired the horse at an early day, probably through Mexico and California, and were instrumental in its distribution among other tribes, whence the application of their name to the Indian pony of the northwest United States.

CAYVAN', GEORGIA (1858-1906). An American actress, born at Bath, Me. She was educated in Boston and was for a time a professional reader. As an actress she first appeared as Hebe in *Pinafore* at the Boston Theatre, 1879. In 1880 she began playing the part of Dolly Dutton in *Hazel Kirke* at the Madison Square Theatre, New York. The next year, at the Globe Theatre, Boston, she made a considerable sensation as Iocasta in *Œdipus Tyrannus* with George Riddle. In 1882 she was Lisa in the melodrama *The White Slave*, at the Fourteenth Street Theatre, New York, and Luxa in *The Romany Rye*, at Booth's Theatre. From 1887 to 1894 she was leading lady of the Lyceum Theatre stock company, winning successes in *The Wife*, *The Charity Ball*, *Squire Kate*, and numerous other plays. An illness obliged her to leave the stage in 1894, and though in the season of 1896-97 she returned and starred for a time, the failure of her health compelled her final retirement. Consult Clapp and Edgett, *Players of the Present* (Dunlap Society, New York, 1899), and Edmunds, in *Famous American Actors of To-Day*, edited by McKay and Wingate (New York, 1896).

CAZAL, MANUEL A. See CASAL, MANUEL A.

CAZALÈS, ká'zà'lès', EDMOND DE (1804-76). A French political writer, son of Jacques Antoine Marie de Cazales. He studied law and received a legal appointment, but soon gave his chief attention to political affairs, and was largely occupied with the question of the reconciliation of the Roman Catholic church with the principles of the Revolution. In 1843 he took holy orders and two years later became director of the ecclesiastical seminary of Nîmes and later of that at Montauban. He was active during the revolution of 1848 and in the events of 1871-72. During the first Republic he served in the Constituent Assembly. He contributed to the *Revue des Deux Mondes* and other periodicals, and published *Études historiques et critiques sur l'Allemagne contemporaine* (1853), and *Nos maux et leur remède* (1874).

CAZALÈS, JACQUES ANTOINE MARIE DE (1758-1805). A French politician. He was captain of dragoons at the assembling of the States General, in which he was an eloquent defender of royal and clerical authority. In the Constituent Assembly he argued for a government intermediate between an absolute and constitutional

monarchy, and with Mirabeau tried to organize a conservative liberal party. He was among the first to formulate the principles of the legitimists. In August, 1790, he fought a duel with Barnave (q.v.). After the arrest of Louis XVI he left France, fled to Italy, and thence went to Spain and England. He returned to Paris in 1803. Consult Chare's introduction to his *Discours de Cazalès* (Paris, 1821), and Aulard, *Les Orateurs de la Constituante* (2d ed., 1905).

CAZALLA DE LA SIERRA, ká-thá'lyá dá lá syár'rá. A mining town of Spain, in the Province of Seville, 53 miles by rail from Seville (Map: Spain, C 4). It is in a rich mineral region which yields silver, copper, iron, and sulphur and has also quarries of marble and jasper, as well as iron foundries and distilleries. Pop., 1900, 7782; 1910, 8044.

CAZEMBE, ká-zém'be, or **KAZEMBE**. A country in Central Africa, north of Lake Bangweolo, divided in 1894 between Great Britain and Belgian Congo (Map: Central Africa, E 4). The name is the hereditary title of an African chief, to whose territory it was applied. The British half is now included in Rhodesia, and Cazembe is its chief town. Livingstone visited the Cazembe in 1868. Copper mines are being exploited in the territory under Congo rule. Consult *The Lands of the Cazembe*, published by the Royal Geographical Society (1873).

CAZIN, ká'zán', **JEAN CHARLES** (1841-1901). A French landscape painter and designer of ceramics. He was born at Samer, Pas-de-Calais, and studied under Lecoq de Boisbaudran and Trélat. In 1868 he was appointed director of the Ecole des Beaux-Arts and conservator of the Museum at Tours. In 1871 he removed to England, devoting himself to designing ceramics for the Fulham pottery. These were of charming decorative effect, especially in their plant decorations. Returning to France, he exhibited for the first time in the Salon of 1876. His subjects are chiefly landscapes—moonlight, twilight, and dusk effects, invested with chastened melancholy and a tender charm. In such subjects he has few, if any, superiors in modern landscape painting. The figures introduced are subordinated to the landscape that environs them, forming with it a harmonious whole. Through such works as "Judith" (1883), "La terre" (Adam and Eve), "Tobit" (1878, Lille), and "Hagar and Ishmael" (1880, Luxembourg), Cazin became the exponent of the landscape of religious sentiment. In his later landscapes the figures are even more incidental. Excellent examples are "Souvenir de fête" (1881, Petit Palais, Paris), "The Journey's End" (1888, Lyons), and a series of river scenes like "The Marne" and "The Bathers." In 1898 he was commissioned to complete the decorations of Puvis de Chavannes in the Pantheon. He received numerous medals and distinctions and was an officer of the Legion of Honor. Besides the paintings above mentioned, the Luxembourg possesses two others and a select collection of his ceramics. He is also represented in the National Gallery, Berlin, the Metropolitan Museum, New York, and the Art Institute, Chicago. He was an ardent champion of encaustic painting, which, especially in his early works, like the "Flight into Egypt," he sought to revive. Consult his biography by Bénédite (Paris, 1901), and Marcel, *La Peinture française au XIXe siècle* (ib., 1905).

CAZORLA, ká-thór'lá. A town of Andalusia, Spain, 40 miles east-northeast of Jaén. It is a

place of considerable antiquity and figured in many incidents of considerable historic interest and importance in the Frontier Wars, the War of Independence, and the Carlist Wars. It is pleasantly situated on a declivity and watered by the Vega. It has two old castles—one an Arab structure. Manufactures of leather, earthenware, soap, and bricks, and a trade in agricultural produce are carried on. Pop., 1900, 7936; 1910, 8866.

CAZOT, ká'zót', **THÉODORE JOSEPH JULES** (1821-1912). A French politician and jurist, born at Alais (Gard). He was elected to the National Assembly in 1871 and in 1875 became a permanent member of the Senate. In 1879-82 he served as Minister of Justice, and in that capacity he was prominent in the execution of the decrees against the Jesuits and unauthorized congregations. He became president of the Court of Cassation in 1883, but resigned in the following year.

CAZOTTE, ká'zót', **JACQUES** (1719-92). A French writer of humorous tales. He wrote a romance, *Olivier* (1762), in prose and in verse; the tales, *Le lord impromptu* (1771) and *Le diable amoureux* (1771); coarse popular songs; and some philosophical works. He joined the fanatic Illuminati about 1775. He opposed the Revolution and was guillotined as a Royalist by the Revolutionary Tribunal. Consult De Nerval, *Illuminés* (Paris, 1852).

CEADDA, kēād'dá, or **CHAD**, SAINT (1672). An English prelate, Bishop of York, and afterward of Lichfield. His boyhood was spent in Ireland in the monastery of Rathmelsige, now Melfont. In 664 he succeeded his brother Cedd in the office of Bishop of the East Saxons in the monastery of Lastingham. Subsequently he was called by Theodore to the South Humberian diocese and spent his last years in the Mercian see, which he himself fixed. Bede, in the *Historia Ecclesiastica Gentis Anglorum*, gives many beautiful examples of this holy man's simplicity and "zealous love of pious toil."

CEAN-BERMUDEZ, thā-án' bér-mōō'dáth, **JUAN AGUSTIN** (1749-1829). A Spanish art historian and painter. He was born at Gijón, Asturias, and studied in Seville under Juan Espinal and in Madrid with Mengs. He painted portraits and decorative compositions, but is best known for his valuable works on art: *Diccionario histórico de los mas ilustres profesores de las bellas artes en España* (1800); *Descripción artística de Sevilla* (1804); *Diálogo sobre el arte de la pintura* (1819); *Noticias de los arquitectos y arquitectura de España* (1829).

CE'ANO'THUS (Neo-Lat., from Gk. *keáo-thos*, *keanothos*, thistle). A genus of American shrubs or small trees, belonging to the family Rhamnaceæ. There are about 40 species, most of which are found in the Pacific Coast States. Many are in cultivation as ornaments, but the most desirable species are only semihardy in the eastern and northern United States. New Jersey tea, or redroot (*Ceanothus americanus*), is a hardy shrub attaining a height of about 3 feet, with ovate, irregularly serrate, bright-green leaves and abundant white flowers in large panicles. The flowers are short-lived, but from their abundance are very ornamental. This species is found in dry woods from Canada to Texas. The leaves are said to have been used as a substitute for tea during the war of the American Revolution and are still so used by poor farmers of the Southern States. Some of the Pacific

species have pink or blue flowers which are very attractive.

CEARÁ, sã'á-rã'. A state of Brazil, on the north coast, bounded by the states of Rio Grande do Norte and Parahyba on the east, Pernambuco on the south, and Piauí and Maranhão on the west (Map: Brazil, K 4). It has an area of 40,250 square miles. The coast regions are sandy and unproductive; the centre is occupied by an elevated plateau, sparsely watered and fit only for pasture. In the mountainous regions the slopes are well adapted for coffee cultivation. The climate is hot and dry. The chief products are corn, rice, sugar, coffee, watermelons, and pineapples. Pop., 1890, 805,687; 1900, 849,127; 1908 (est.), 886,000. Capital, Fortaleza (q.v.). Consult Fontenelle, *The State of Ceará* (Chicago, 1893).

CEARÁ. See FORTALEZA.

CEARÁ MIRIM, sã'á-rã' mē-rēn'. A town of Brazil, in the State of Rio Grande do Norte, on the Ceará Mirim River. It has sugar and cotton manufactures and is in a cattle-grazing district. Pop., 18,000.

CEB'ADIL'LA. See SABADILLA.

CEBALLOS, sã-bã'lyòs, JOSÉ (1831-93). A Mexican soldier. He was born in the city of Durango, defended the plaza of Nazatlán against the French, and was appointed brigadier general in 1870, in which capacity he commanded the First Division of the federal troops of Mexico in the campaign against the bandit Losada, who had placed himself at the head of a force of 10,000 Indians. Upon the installation of Lerdo de Tejada as President of Mexico, Ceballos had Camarón, the Governor of Jalisco, deposed after a long and sanguinary engagement between the federal and state troops. Ceballos remained as Governor of Jalisco until 1876, when Lerdo's government was superseded by that of Díaz. He later went to California and then to Guatemala, where he was appointed director of the Military School. After plotting a revolution against Díaz, he suddenly espoused the cause of the latter, went to Mexico, and was appointed Governor of the Federal District, the highest office after the presidency. He frequently antagonized the press, and in 1885 a number of journalists and students were imprisoned by him.

CEBALLOS, JUAN BAUTISTA (1811-c.1854). A Mexican jurist, born at Durango. He was made president of the Supreme Court in 1852. Upon the resignation of Arista, in 1853, he became President of Mexico *ad interim*, with extraordinary powers for three months. A month later he resigned. His failure was chiefly due to conditions beyond his control. Still his administration of one month produced two important measures. The first concerned a new Tehuantepec interoceanic contract that brought money into the treasury; and the second gave official recognition to civil marriages with foreigners, against which the Church fought as an infringement of its rights.

CEBALLOS, PEDRO. See CEVALLOS.

CEBENNA. See CEVENNES.

CEBES (Gk. Κέβης). A Greek philosopher, born at Thebes in Bœotia. He was a disciple of Socrates, at whose death he was present, and also of Philolaus. He is represented by Plato as a serious-minded thinker eager for philosophical knowledge. He is reported to have written three dialogues in the Socratic style—the *Phrynichus*,

the *Hebdome*, and the *Pinax*, or *Tabula*. A work named *Pinax*, now extant, was probably written, however, in the first century A.D. by a Stoic or a Cynic. It professes to be the explanation of an allegorical picture in a temple of Cronus representing human life and the condition of the soul before its union with the body. It inculcates the Socratic doctrine that only education of the mind and consciousness of virtue can lead to happiness. Edited by Præchter (Marburg, 1893).

CEBETIS TABULA. See CEBES.

CEB'IDÆ (Neo-Lat. nom. pl., from *Cebus*, from Gk. κῆβος, *kēbos*, long-tailed monkey). A family of Primates embracing all the American monkeys (formerly designated as platyrrhine) except the marmosets. The features in which they differ from the monkeys of the Old World are stated under MONKEY. The family includes several genera described under DOUROUCOLI; HOWLER; SAKI MONKEY; SAPAJOU; SPIDER MONKEY; SQUIRREL MONKEY; TITI MONKEY; UAKARI.

CEBÚ. See HUMPED CATTLE.

CEBÚ, sã-bũ', *Sp. pron.* thã-bũ', or **ZEBU**. One of the Philippine Islands, situated between the islands of Bohol and Leyte on the east and Negros on the west, and lying between lat. 9° 25' and 11° 20' N. and long. 123° 10' and 124° 5' E. (Map: Philippine Islands, D 5). It is of an oblong form and has a length of about 130 miles, but does not exceed 20 miles in breadth. Area, 1782 square miles. Its surface is very mountainous, but only moderate altitudes are reached. The soil is fertile and produces tobacco, cotton, sugar, vegetables, rice, and hemp. The reported minerals are coal, gold, lead, silver, and iron. Some petroleum is found on the west coast. Manufactures include native wine, sugar, cloth, pottery, and cheeses. Fishing, especially for sponges, is an important industry. The population of the island is (1903) 592,242, and of the province, which includes the neighboring islands of Camotes, Mactán, Bantayan, and others, is 653,727, consisting of Visayas, Mundos, and some Negritos. Capital, Cebú (q.v.).

CEBÚ. The capital of the island Province of Cebú, Philippines, formerly the seat of government of the entire Visayan group (Map: Philippine Islands, D 5). The town, which is situated on the east coast of the island and fortified by a triangular fort, is well built and contains an episcopal palace, a post office, and the cathedral of San Nicolás. It is the chief commercial centre of the Visayan Islands. Cebú is regarded as the oldest city in the Philippines, and was the capital of the archipelago from 1565 to 1571. Magellan is said to have died on the island of Mactán, to the east of the city, and in the Rizál, a small building in the plaza, is a cross which, according to tradition, was planted in Cebú by Magellan when he took possession. Pop., 1903, 31,070.

CECCHI, chék'kě, ANTONIO (1849-96). An Italian explorer. He was born in Pesaro and was educated in Pesaro, Trieste, and Venice. In 1877 he joined the Italian geographical expedition to Abyssinia, and in 1885 he accompanied the first Italian military expedition to Massowah and later concluded a naval and commercial treaty with the Sultan of Zanzibar. In 1894 he became Consul General in Zanzibar. He was murdered by the Somalis. He wrote *Da Zeila alle frontiere del Caffa* (1887) and *L'Abissinia settentrionale* (1887).

CECCO D' ASCOLI, chék'kó däs'kó-lē (c.1257-1327). The popular name of Francesco degli Stabili, a learned Italian astrologer and poet. He studied mathematics and astrology and was professor in the University of Bologna. Having published a commentary on Sacrobosco's *Sphæra Mundi*, in which he propounded bold theories concerning the employment and agency of demons, the Clerical party caused him to be condemned to certain fasts, prayers, and fines; but he eluded punishment by going to Florence. His freethinking and plain speaking, however, procured him many enemies. They took advantage of the fact that he had attacked Dante's *Commedia*. He was again tried for heresy, sentenced, and burned at the stake in Florence, in the seventieth year of his age. Consult W. S. C. Baddely, *Charles III . . . also Cecco d' Ascoli, Poet, Astrologer, Physician* (London, 1894).

CECH, chék, SVATOPLUK (1846-). A Czech poet. He was born at Ostredék and was educated at Prague. As a poet, Cech is the foremost representative of the distinctively national Czech poetry. He excels more particularly in the epic genre, while his numerous tales, sketches, personal reminiscences, satires, and novels constitute the finest prose productions in the national literature of Bohemia. In 1895 he was elected to the Austrian Reichsrat. The following are a few of his principal works: *Poems* (1874), containing, among others, the epics entitled "The Angels" and "The Dreams"; *New Collection* (4th ed., 1896); *The Circassian* (1883); *The Candidate for Immortality* (1884). Consult J. Sutnar, *S. Cechs Leben und Werke* (1898).

CECID'ITUM. See GALL; MALFORMATION.

CECIDOMYIIDÆ, sēs'i-dō-mī'yī-dē (Neo-Lat. nom. pl., from Gk. κηκίς, *kēkís*, gallnut, from κηκίον, *kēkíon*, to gush forth + *μυία*, *myia*, fly). A family of minute flies, with hairy bodies, sparsely veined wings, and many-jointed antennæ, furnished with whorls of hair. Most of the larvæ make galls. See GALL INSECTS.

CECIL, sēs'il or sīs'il, RICHARD (1748-1810). An English evangelical divine of the Established church, born in London. He originally professed skeptical views, but in 1772 was converted, and from 1773 studied at Queen's College, Oxford. In 1777 he was ordained priest, and in 1780 he became rector of St. John's, Bedford Row, London. He was distinguished for his eloquence, and was considered the most prominent evangelist of his time. His collected works (4 vols., 1811) have been often reprinted (e.g., in New York in 1845, 3 vols.), and contain, particularly in vol. iv, valuable contributions to the discussion of various religious questions. Consult Pratt, "A Memoir of the Character of the Rev. R. Cecil," vol. i of the *Works* (London, 1811).

CECIL, ROBERT, EARL OF SALISBURY (c. 1563-1612). An English statesman and son of William Cecil, Lord Burghley (q.v.). He was born probably about 1563, although both the exact date and place of his birth are unknown. A sickly child, he was educated at home, but spent some years at Cambridge and in travel on the Continent. In 1588 he went with Lord Derby in his unsuccessful attempt to arrange a treaty of peace with the Duke of Parma. In 1589 he entered Parliament and was a member of the succeeding Parliaments of the reign of Elizabeth. At about the same time he took up the duties of Secretary of State, although he was not actually appointed to this post until

1596. In 1591 he was knighted, and a few months later he entered the Privy Council. The main direction of foreign affairs was in his hands, and in 1598 he headed an embassy to France to negotiate against peace between France and Spain. On August 4 of that year his father died, and Cecil inherited much of his father's influence, which, however, he had to defend against the Earl of Essex (q.v.). The mistakes of the latter, culminating in his trial and execution in 1601, freed Cecil from danger on this side, and during the last two years of the Queen's life he engaged in secret negotiations with James VI of Scotland, which greatly facilitated the latter's accession to the English throne in 1603 as James I. The grateful King showered honors on him, culminating in his creation as Earl of Salisbury in 1605, and he remained until his death the leading minister of the crown. The old Elizabethan, however, was out of his element. Cold, methodical, and versed in business, he made few friends, and with the people he was distinctly unpopular. Worst of all, he utterly failed to perceive, as did Bacon, the change of atmosphere that had come over England since the death of Elizabeth. Intent on securing revenue, he urged James on in his attempt to secure money without parliamentary grant, thus raising the storm that was to ruin the Stuart dynasty. In 1608 he became Lord Treasurer, and his management of the finances was extremely able, but all his ability was thrown away in the face of James's stupid prodigality. An attempt to come to terms with Parliament in 1610 failed, although Salisbury was willing to make vital concessions. His many labors broke down his never rugged health, and he died, worn out, May 24, 1612.

Bibliography. There is no life of Cecil. Many of his letters are in the *Cecil Papers* published in 8 vols. by the Historical Manuscripts Commission. The best account of Cecil's career (1603-12) is in Gardner, *History of England*, vols. i, ii (London, 1883-84).

CECIL, WILLIAM, LORD BURLEIGH or BURGHLEY (1520-98). One of England's foremost statesmen, the son of Richard Cecil, Master of the Robes to Henry VIII. He was born at Bourne, Sept. 13, 1520. He was educated at Grantham and Stamford grammar schools, and at St. John's College, Cambridge, where he distinguished himself, especially in Greek. Before he could take his degree he was removed by his father, and entered as a law student at Gray's Inn, to prevent his marriage with Mary, the sister of Cheke, the Greek professor. William, however, married her two months after his advent in London; but his happiness was short-lived, for she died on Feb. 22, 1544. The following year (Dec. 21, 1545) he married Mildred, daughter of Sir Anthony Cooke, a union which increased his political influence. In 1547 he became *Custos Brevium* in the Court of Common Pleas, the reversion of which Henry VIII had previously given him, and in 1548 his friend, the Lord Protector Somerset, appointed him his secretary. He shared in Somerset's downfall and imprisonment; but two years later, by his wisdom and prudence, was appointed Secretary of State by the Duke of Northumberland, Somerset's enemy. When Queen Mary ascended the throne, Cecil, as a Protestant, resigned office, but maintained good relations with the Roman Catholic party, and was one of the few eminent Protestants who escaped in purse and person

during her reign. Owing to his freedom from persecution, he has been unjustly accused of being a "trimmer." Cecil was cautious and politic, and averse to extremes in religion, and his essentially Erastian frame of mind inclined him to support the religion of the state. The rejection of the bill which the Roman Catholics introduced into Parliament, to confiscate the estates of Protestants, was mainly due to him. Cecil was merciful and tolerant, as compared with the narrow Whitgift or the bigoted Aylmer; but he was not guiltless of the cruel religious persecutions which disgraced Elizabeth's reign. The use of the torture and the employment of spies are a dishonor to his memory. Prior to Mary's death, Cecil corresponded with Elizabeth, who recognized his capacity for government and appointed him Secretary of State on her accession to the throne (Nov. 16, 1558). For 40 years he was the originator and director of that policy which made Elizabeth's reign memorable, and although Elizabeth occasionally favored other courtiers, Cecil was the statesman whose judgment she relied on in all matters of importance. His policy at home and abroad was shrewd, cautious, liberal, and comprehensive, and the quality of prompt decision was also his. As a statesman he was above animosities and favoritism; his enemies never suffered and his friends profited nothing by his power. He was a man of classical attainments and a voluminous writer. In 1564 Cambridge created him M.A., and Oxford conferred the same honor in 1566. The Queen created him Baron Burleigh, Knight of the Garter, and Lord High Treasurer. He died Aug. 15, 1598. Consult: Nares, *Memoirs of Lord Burghley* (3 vols., London, 1828-31), and Macaulay's famous review of it (*Burleigh and his Times*); Hume, *Great Lord Burleigh* (London, 1898). Much of his correspondence is to be found in the *Cecil Correspondence at Hatfield House* (published by the Historical Manuscripts Commission, 8 vols., London, 1883-99). Consult also the *Calendar of State Papers Foreign*, which had in 1913 published the documents down to 1582.

CECIL, or **GASCOYNE-CECIL**, gās-koin', ROBERT ARTHUR TALBOT GASCOYNE. See SALISBURY, MARQUIS OF.

CECILIA. The second of Frances Burney D'Arblay's novels, dealing with domestic life. See D'ARBLAY, MADAME.

CECILIA, SAINT. The patroness of music, who is said to have suffered martyrdom in 230 A.D. Her heathen parents, as we are told, belonged to a noble Roman family and betrothed their daughter, who had been converted to Christianity, to a heathen youth named Valerian. This youth and his brother, Tiberius, became Christian converts and suffered martyrdom. Cecilia, when commanded to sacrifice to idols, firmly refused and was condemned to death. Her persecutors, it is said, first threw her into a boiling bath, but on the following day they found her unhurt. The executioner next attempted to cut off her head, but when he did not succeed in three strokes he was obliged by the law to abandon the attempt. She lived three days longer. As early as the fifth century there is mention of a church dedicated to her at Rome; and in 821, by order of Pope Paschal, her bones were deposited there. Since her story speaks of her singing to God in her heart, she came to be regarded as the patroness of Church

music, and even as the inventor of the organ. Her festival is celebrated on November 22. Chaucer, Dryden, and Pope have celebrated St. Cecilia, and the painters Raphael, Domenichino, Carlo Dolci, and others have represented her in art. Consult Guéranger, *Sainte Cécile et la société romaine* (Paris, 1873).—Another St. Cecilia was born in Africa and suffered martyrdom by starvation under Diocletian. The Roman Catholic church celebrates her festival on February 11.

CECILIA, SAINT. A favorite subject with religious painters. She is represented as a young woman, either at the organ or with some musical instrument, attended by saints or angels. The finest and most famous painting of the subject is by Raphael, in the Gallery of Bologna, in which St. Cecilia, standing in the midst of four saints and holding in her hands a small organ, listens enraptured to the angels above. Well known also is the painting by Rubens in the Berlin Gallery, in which his second wife is represented as St. Cecilia, singing and playing the harpsichord and attended by four angels. Other well-known pictures of her are by Guercino and Domenichino, both in the Louvre, and, among moderns, by Ary Scheffer, Sir Joshua Reynolds, John Singleton Copley, and F. S. Church. Above her tomb in Santa Cecilia-in-Trastevere, Rome, is a beautiful recumbent marble figure by Stefano Maderna, representing the saint after her martyrdom, with head partially severed.

CECILIA, THE STORY OF SAINT. A series of frescoes (1588-89), five in number, by Domenichino (q.v.), representing the charity, fervor, martyrdom, and final rewards of St. Cecilia. They are in the church of San Luigi dei Francesi, Rome.

CECROPIA (Neo-Lat., from Gk. Κέκροψ, *Kekrops*, according to Greek myth founder of Athens). A genus of trees of the family Artocarpaceæ. *Cecropia peltata*, a native of the West Indies and of South America, sometimes called trumpetwood and snakewood, is remarkable for its hollow stem and branches, exhibiting merely membranous partitions at the nodes. The small branches, these partitions being removed, are made into wind instruments. The wood is very light, readily ignites by friction against a harder piece of wood, and is much used by the Indians for procuring fire in this way. The fruit is agreeable and resembles a raspberry. Both the trunk and branches yield a large quantity of saline matter, which is employed by the French planters in the purification of sugar. The bark is strong and fibrous and is much used for cordage. It is also astringent and is applied in diarrhoea and other diseases. This species is an example of myrmecophily in which ants dwell in the hollow stems. In return for the service of the tree in affording them shelter and food, they protect the tree from attacks of leaf-cutting ants, which abound in the tropics.

CECROPIA MOTH. The largest of the silk-worm moths (*Samia cecropia*), with wings expanding 5 to 6 inches, brown, marked by white, red, and buff. The caterpillar has coral-red tubercles on the second and third thoracic segments, and other tubercles, yellow and blue; it feeds on a great variety of forest and fruit trees. The cocoon is elongated, brown, papery, and unprotected by leaves. See SILKWORM.

CE'CROPS (Lat., Gk. Κέκροψ, *Kekrops*).

The first King of Attica, who figures in Greek mythology as an autochthon, half man and half serpent. At first probably the eponymous hero and ancestor of the people, he seems to have been crowded aside later by the figure of Erechtheus, though whether we have here the heroes of separate tribes may well be doubted. Later legend attributed to him, as the first King of Attica, the formation of a confederacy of 12 cities, the introduction of marriage, burial of the dead, writing, and other arts. Made umpire in the contest of Athena and Poseidon over Attica, he decided for Athena. See **PARTHENON**.

CEDAR (OF. *cedre*, Lat. *cedrus*, from Gk. *κέδρος*, *kedros*, cedar tree). A name applied to several species of coniferous evergreen trees, as well as to the wood of a number of trees in no way related to the conifers. The name properly belongs to the genus *Cedrus*, of which there are three species generally recognized—*Cedrus libani*, the cedar of Lebanon; *Cedrus deodara*, the deodar tree of India; and *Cedrus atlantica*, of the mountains of northern Africa. By some botanists the first and last are considered as one species. All are characterized by their fragrant, light-red, durable wood. The cedars of Lebanon have been famous from early times, being frequently mentioned in sacred and profane writings. The original groves mentioned in the Bible have become greatly reduced through various causes, and the largest grove now known contains only about 400 trees, some of which are evidently of great age. The trees are noted for the size of their trunks rather than for their height. They differ from most conifers in that their branches are widespreading. The cones and leaves resemble those of the larch more than any other tree, except that the leaves are persistent. The cedar of Lebanon was introduced into England in the seventeenth century, and a number of noble specimens are now growing in that country. (For detailed illustration, see Plate of **CALABASH**.) It is hardy in the United States only in the South and in California. In its natural home the cedar of Lebanon is found at elevations of 6000 feet or less, but it thrives best in sandy loam, where the roots can reach water. A white resin, called cedar resin, is exuded by the trunks and was formerly employed in embalming. A sort of oil or turpentine was also prepared from it, but neither the oil nor the resin is much known now. The deodar, or God tree, and the *Cedrus atlantica* resemble *Cedrus libani* in appearance and have similar uses. They are more abundant, and their timber is very valuable. The deodar forms extensive forests in the Himalayas at elevations of from 7000 to 10,000 feet. The trees often attain a height of 150 feet and a diameter of 8 feet. The wood takes a high polish and is in demand for cabinetwork. *Cedrus atlantica* is most abundant in the Atlas Mountains and is used for the same purposes. Many other coniferous trees are given the name "cedar." The Siberian cedar is *Pinus cembra*; Goa cedar, a species of cypress; red cedar, species of *Juniperus* (see **JUNIPER**), etc.

The white cedar of the United States is *Chamaecyparis thyoides*, a tree 30 to 90 feet high, found growing in swampy situations from Maine to Mississippi. The trees are evergreen, with small, scalelike leaves. The wood is exceedingly durable, especially when in contact with moisture. The tree resembles the arbor vitae, which is also sometimes called white cedar. The yel-

low cedar of the Pacific coast is *Chamaecyparis nootkatensis*. It is found from northern California to Alaska. The wood when seasoned is a beautiful light yellow and takes a high polish, on which account it is highly esteemed for finishing lumber and cabinetwork. The Port Orford cedar (*Chamaecyparis lawsoniana*) is quite similar and is found in Oregon and California. There are many horticultural varieties of these cedars in cultivation, that vary in their habit of growth and color of foliage. Among trees not allied to the conifers to which the name "cedar" is given are species of *Cedrela*, which furnish the wood from which cigar boxes are so extensively made. The Australian cedar is of the same genus, the species being *Cedrela toona* or *Cedrela australis*. This is an important timber tree which is put to many uses. It yields gum, a resin, and tanbark, in addition to timber. This or a similar species is found in India. The cedar wood of Guiana is from *Protium altissimum*. In Australia *Melia composita* is called white cedar.

CEDAR, BARBADOS (*Cedrela odorata*). A tree of the family *Cedrelaceæ*, and of the same genus with the toona, a native of the West Indies and warm parts of America. It is called "cedar" in the West Indies. It is often upward of 80 feet high, with a trunk remarkable for thickness. It has panicles of flowers resembling those of the hyacinth. The fruit, bark, and leaves have the smell of asafetida, but the wood has an agreeable fragrance. Being soft and light, it is used for canoes and for shingles. Cigar boxes are very generally made of it, and it supplies some of the wood used in the manufacture of lead pencils.

CEDAR APPLES. Outgrowths of frequent occurrence upon the red cedar or juniper. They are caused by fungi, *Gymnosporangium macropus* and other species. (For illustration, see **FUNGI**.) During most of the season they may be seen as warts or knots of greater or less size on the twigs. At first they have about the same color as the branch, but later become brown. In the spring of the year they undergo a marked transformation and appear as horn-shaped masses of orange or yellow colored jelly. These contain the spores of the fungus, and upon drying they are blown about. Lighting upon an apple tree, they cause apple rust. See also *Apple Diseases*, under **APPLE**.

CEDAR BIRD, or **CHERRY BIRD**. See **WAXWING**.

CEDAR CREEK. A stream in Shenandoah Co., Va., falling into the Shenandoah River. On its banks, on Oct. 19, 1864, during the Civil War, a Confederate force under General Early completely surprised Sheridan's army at daybreak, during its leader's absence, and forced it to retreat in considerable disorder back through Middletown; but about 10 o'clock the cavalry and part of Wright's corps (the Sixth) succeeded in checking the advance of the Confederates. General Sheridan, who was just returning from Washington, was at Winchester when the firing began, but hastened to the front and, rallying his troops, ordered a countercharge at about three o'clock in the afternoon. Many of the Confederates had left their ranks to plunder the Federal camp, and in turn they broke and fled and were pursued as far as Fisher's Hill. Next day the retreat was continued to New Market. Sheridan's forces then returned to Kernstown for winter quarters.

Sheridan had about 31,000 troops, and Early 18,500. The Federal loss was 644 killed, 3430 wounded, 1590 missing; the Confederate, 320 killed, 1540 wounded, 1050 missing. Sheridan recaptured his lost guns and 23 of Early's. This battle ended the last attempt on the part of the Confederates to strike the North through the Shenandoah valley. Sheridan's famous ride from Winchester, his enthusiastic reception at the hands of his troops, and his remarkable success in turning a disastrous rout into a brilliant victory, form, perhaps, the most dramatic episode of the Civil War. They furnished the theme of a stirring poem by T. Buchanan Read, "Sheridan's Ride." Consult Pond, *The Shenandoah Valley in 1864* (New York, 1883), and Sheridan, *Personal Memoirs* (3 vols., New York, 1888).

CEDAR FALLS. A city in Black Hawk Co., Iowa, 100 miles west of Dubuque, on the Illinois Central, the Chicago, Rock Island, and Pacific, Chicago Great Western, and the Waterloo, Cedar Falls, and Northern railroads, and on Cedar River (Map: Iowa, E 2). The city has a Carnegie library, State normal library, a hospital, and two parks, and is the seat of the Iowa State Teachers' College. It is a manufacturing place of importance, having good water power, and possesses flour, feed, oatmeal, and planing mills, clothing, wagon, and gate factories, corn-canning works, foundry, house-furnishing factory, feeder and stacker works, etc. Settled in 1845, Cedar Falls was first incorporated as a village in 1853. At present it is governed under the charter of 1865, which provides for a mayor, elected every two years, and a city council. The water works and electric light plant are owned by the city. Pop., 1900, 5319; 1910, 5012.

CEDAR KEY. A town and seaport in Levy Co., Fla., on a small island just off the coast in the Gulf of Mexico, and on the Seaboard Air Line Railroad (Map: Florida, C 2). The harbor, which admits vessels of light draft, is formed by several small keys, on one of which is a tall lighthouse with a fixed white light, varied by a white flash every minute. The town has several saw mills, most of which cut red cedar wood for pencils, which is a leading export. It has a considerable trade also in fish, oysters, sponges, palmetto fibre, and lumber. Pop., 1910, 864.

CEDAR MOUNTAIN. A hill in Culpeper Co., Va., near which on Aug. 9, 1862, a sharp battle was fought between 8000 Federals of Pope's army, under General Banks, and about 24,000 Confederates, under General Jackson. Banks gained a slight advantage at first, but was swept from the field by the spirited attack of Jackson's reserves. Pope's whole force advancing, Jackson fell back towards Gordonsville to join General Lee. The reported losses were, for the Federals, 1661 killed and wounded and 723 missing; for the Confederates, 1283 killed and wounded and 31 missing. It was the first serious engagement fought by the Army of Virginia under Pope. Consult Ropes, *The Army under Pope* (New York, 1881).

CEDAR MOUNTAINS. A mountain range of southwest Cape Colony, South Africa, lying parallel with the Atlantic, and separating the valley of the Olifante River on the west from its tributary the Doorn on the east. The highest summit is Sneeuwkop, about 6300 feet altitude.

CEDAR OF GO'A. See CYPRESS.

CEDAR RAPIDS. A city of Linn Co., Iowa, 79 miles (direct) southwest of Dubuque, on the Cedar River, and on the Chicago, Rock Island, and Pacific, the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Illinois Central railroads (Map: Iowa, F 2). Several bridges, including four railroad bridges, cross the river at this point. Cedar Rapids is the seat of the Coe College (Presbyterian), founded 1881, and has Carnegie and Masonic libraries, a government building, an auditorium, two theatres, several parks, and the Holly system of water works, owned municipally. It is the headquarters of the Order of Railway Conductors. The city, which lies in a rich agricultural country, has extensive wholesale houses and pork-packing establishments, and large railroad machine shops. The manufacturing plants include two large cereal mills, barley and flour mills, starch factory, machine shops, planing mills, agricultural-implement works, carriage factories, windmill and pump factories, tanneries, cement brick and block plants, etc. The rapids furnish water power for many factories. Settled in 1845, Cedar Rapids was incorporated in 1856. It has adopted the commission form of government. Pop., 1900, 25,656; 1910, 32,811; 1920, 45,566.

CEDAR, or RED CEDAR, RIVER. A river rising in Freeborn and Mower counties, southern Minnesota (Map: Minnesota, F 7). It flows southeast across Iowa from the northern to the southeastern boundary, emptying into the Iowa River at Columbus Junction, Louisa County, about 30 miles above where the latter stream joins the Mississippi. It is about 275 miles long and drains a beautiful and fertile region. The chief cities along its course are Waterloo, Vinton, and Cedar Rapids.

CEDARTOWN. A city and the county seat of Polk Co., Ga., 60 miles northwest of Atlanta, on the Seaboard Air Line, the Central of Georgia, and the Louisville and Nashville railroads (Map: Georgia, A 1). Cedar and pine timber and valuable mineral deposits are found in the vicinity, and the city has a box factory, marble works, planing, cotton-yarn, and knitting mills, charcoal iron furnaces, foundries, iron mines, oil and fertilizer works, and railroad repair shops. The water works and lighting plant are owned by the municipality. Pop., 1900, 2823; 1910, 3551.

CEDD, kēd, or CEDDA, kēd'dá, SAINT (?-664). A brother of St. Chad or Ceadda, with whom he is often confused. He was born in Northumbria, brought up by Bishop Aidan, Christianized Essex and other parts of England, was made Bishop of the East Saxons (654), founded two monasteries, and was famed for learning and sanctity. He died in the monastery at Laestingaen, now Lastingham, a village about 25 miles northeast of York. His day is January 7.

CEDIL/LA. See DIACRITICAL MARKS.

CEDROS, sā'thrōs, or CERROS, sēr'rōs. An island of Mexico, situated in the Pacific off the west coast of Lower California, where it forms part of the western boundary of San Sebastián Viscaino Bay (Map: Mexico, A 3). It lies between lat. 28° 5' and 28° 35' N. Its total area is estimated at 120 square miles. The surface is mountainous and partly barren. The climate is dry. Mineral deposits of importance are supposed to exist.

CÉDULA, thā'dōō-lā (obsolete Eng. *cedule*,

Fr. *cédula*, It. *cedola*, *cedula*, whence Ger. *Zettel*, slip of paper; variant of *schedule*, OF. *schedule*, *scedule*, *cedule*, from Lat. *schedula*, small sheet of paper, from *scheda*, sheet of paper, from *scindere*, to split). In Spanish, a written or printed paper of any sort, including blank forms. In Spanish law, any kind of a legal document, public or private, the exact nature of the document being indicated by supplementary words; e.g., *cédula real*, a royal order promulgating a law or decree; *cédula hipotecaria*, a mortgage loan certificate; *cédula ante diem*, a summons to a meeting of a society.

Cédula personal is a certificate of identification. Under the Spanish régime every inhabitant or resident of the Philippine Islands was required to take out, annually, such a certificate, and (unless legally exempt) to pay for it at a rate varying, according to his resources, from 2 pesos to 37.50 pesos. The graduated poll tax thus established yielded an annual revenue of 7,000,000 pesos. The American military government found it necessary, for administrative purposes, to retain the *cédula personal*, but decided to issue it at the nominal and uniform rate of 1 peseta.

CEPALÚ, chā'fā-lōō' (ancient Lat. *Cephalœdium*). An episcopal city and seaport in the Province of Palermo, north Sicily, 42 miles east by south of Palermo (Map: Italy, J 9). It is grouped around the cathedral begun by Roger II in the twelfth century. Its mosaics are the most ancient and perfect in Sicily and resemble those of Mount Athos. The town lies at the base of the steep limestone promontory which towers to the height of over 1200 feet, and which bears the ruins of the ancient town. Fisheries and commerce are engaged in by the inhabitants. Pop., 1901, 13,273; 1911, 14,341.

CEGLIE MESSAPICA, chā'lyā mās'sā-pē'kā. A city in the Province of Lecce, south Italy, 18 miles northeast of Taranto, and 27 miles from Brindisi (Map: Italy, M 7). It markets large quantities of wine, fruit, and oil, and quarries stone. Pop., 1901, 16,867; 1911, 17,844.

CEHEGÍN, thā'ā-hēn'. A town of Spain, in the Province of Murcia, 37 miles west-northwest of the city of that name (Map: Spain, E 3). It has some spacious streets, with handsome buildings. The town is in a fertile region, has a trade in grain, oil, wine, fruits, etc., and has manufactures of paper, cloth, and pottery. Pop., 1900, 11,523; 1910, 13,313.

CEIBA, sā'bā. A small and growing port on the Atlantic coast of Honduras, 60 miles southwest of Trujillo. The chief trade is in bananas, Ceiba being in the midst of a large plantation district. Other exports are coconuts, soap, rubber, sarsaparilla, hides, tropical fruits, and mahogany logs. There are several experimental plantations of cotton and cacao.

CEILING (OF., Fr. *ciel*, Lat. *cælum*, sky). The inner lining of an inclosed structure when distinct from the structural walls and roof; and by extension and restriction, the top covering of a room or hall. In the first sense, however, it is not used of plastering, tiling, or flooring. A ceiling in this sense may be partial, like a wainscot, or a complete sheathing internally with wood or metal (e.g., Solomon's Temple: consult 1 Kings vi. 9, 15). In the second sense it may be either the underside of the floor or roof immediately above the room; or, as is more often the case, a wholly inde-

pendent decorative construction, merely suspended from or attached to the roof or floor above it. Vaulted and domed ceilings are more often termed "vaults" and "domes" than "ceilings."

In Egyptian temples the underside of the flat stone roofs formed the ceiling and was generally painted blue, with yellow stars, bands of hieroglyphs, and emblems of the heavens. The ceilings of Babylon and Assyria were stuccoed and painted, and apparently gilding was used in the sanctuaries. The horizontal ceilings of Greek art were deeply paneled (coffered), and the flat surfaces of the panels were painted, but with ornaments, not figures. Roman ceiling decoration combined to perfection both types—the flat and the curved surfaces. The pictorial sense of Græco-Roman artists seized on the decorative possibilities of the ceiling. From the great domes, tunnel vaults, and groin vaults of the Imperial baths and the flat ceilings of the temples and basilicas, down to the minor ceilings of tombs and private houses, all were covered according to one of three systems: (1) coffering or paneling, or combinations of them used both on flat and curved surfaces; (2) stucco reliefs, mainly on curved surfaces; (3) decoration by simple painting, also on curved surfaces. The stuccoed ceilings of the Pompeian baths, of the tombs on the Via Latina, and of the "House of Livia" in Rome show the exquisite taste and dash of these facile works. The elaborate painted ceilings of the substructions of the baths of Titus, discovered in the sixteenth century, furnished the models for the arabesques and grotesques which Raphael made so popular in his Vatican *Loggie* and which have been ever since in continual use. With the fall of Roman art, ceiling decoration disappeared entirely in the West, to be revived only after six centuries in the Romanesque period. But in the Orient there was no such intermission. On the contrary, Byzantine art, with its discovery of marble, glass, and mosaic incrustation as a covering for the surfaces of vaults, added a previously unknown element of deep and rich color, which gave a mysteriously impressive effect to the ceilings; and this was helped by its use of curved ceilings, wherever possible, even in civil structures. Such are the domes of the Ravenna baptisteries, of St. Mark's in Venice, and the churches of Salonica and Constantinople. This mosaic decoration strikes a note of seriousness in contrast to the playfulness of Roman decoration. One important fact is that Byzantine ceilings always present an unbroken surface. This same ideal—of curves and of deep surface coloring—was developed by Mohammedan art; but in the buildings erected in the Mohammedan style there were few unbroken lines and surfaces, and flat ceilings on carved beams were often used. Stalactite corbeling and geometric surface decoration were combined with coloring even more brilliant than that of the Byzantines. When, in the West, mediæval art gave up its severe simplicity of unconcealed beams and rafters, ceiling design followed two different lines of development—that of the stone vault and that of the wooden ceiling. Both of these reached their highest development in England, where the simpler forms of groined vaulting with molded ribs, which the French always preferred, were exchanged for an increasingly elaborate system of multiple ribs that finally developed into the superb fan vaulting of

the sixteenth century (see VAULTING); while the wooden ceiling, with the trusses and entire framework of the roof supports, were made richly decorative in the splendid hammer-beam types of English churches and halls—a type which lasted well into the seventeenth century. The Renaissance abandoned the ribbed vault and in Italy developed three principal types of ceiling: the smooth vaulted ceiling with or without “penetrations” plastered and painted in fresco or tempera, as in the Sistine Chapel at Rome; the coved ceiling with penetrations, having a flat central field and curves (coving) along the sides and ends penetrated by lunettes, the whole richly painted; and the flat paneled ceiling of wood or plaster, in endless variety of decoration, which reached its highest splendor in Venice (Doge's Palace), with sumptuously carved panels framing paintings by Titian, Tintoretto, and Veronese. Plaster and stucco came into general use throughout Europe, and in England a very charming type of flat ceiling was developed with all-over decorations modeled in low relief in the plaster. See PAINTING; STUCCO.

CEILLIER, sâ'yâ', RÉMY (1688–1761). A French Benedictine scholar. He was born in Bar-le-Duc, France, became titular prior of the Benedictine monastery of Flavigny, near Nancy, and there died. His enduring fame rests upon his laborious and exhaustive analysis of ecclesiastical literature down to the middle of the thirteenth century, *Histoire générale des auteurs sacrés et ecclésiastiques* (23 vols., 1729–63; new ed., 14 vols., 1858–65).

CELAENAE (Gk. Κελαιναί, *Kelainai*). A flourishing commercial city of ancient Phrygia, at the sources of the Marsyas and the Mæander, with a citadel and a royal palace. Cyrus the Younger had a park there. The city passed into the power of Alexander the Great in 333 B.C. His successors occupied it till Antiochus Soter refounded it as the Phrygian Apamea.

CELÆNO. See HARPY.

CELAPOVSKÝ, ch'lá-kót'ské, FRANTIŠEK LADISLAV (1799–1852). A Czech poet and Pan-Slavist. He was born in Strakonitz and was educated at the University of Prague. In 1842 he held the chair of Slavonic philology at Breslau. He exercised a considerable influence upon the development of Czech literature, made numerous translations from the German, Russian, and English, and published a large number of poetic and other works, among which are the following: *Echoes of Russian Folksongs* (1820); *Echoes of Bohemian Folksongs* (1840); *The Centifolious Rose* (1840), a cycle of didactic, political, and love poems. Besides, he edited a collection of Slavonic proverbs, *The Wisdom of Slavonic Peoples in Proverb* (1852).

CELAPOVSKÝ, LADISLAV (1834–1902). An Austrian botanist, son of the preceding. He was born and educated in Prague and in 1860 was appointed custodian of the botanical department in the Bohemian Museum in that city. In 1882 he became professor of botany at the Czech University of Prague. Among his numerous and valuable works are the following: *Prodromus der Flora von Böhmen* (1867–81); *Ueber die morphologische Bedeutung der Samenknospen* (1874); *Vergleichende Darstellung der Placenten in den Fruchtknoten der Phanerogamen* (1876); *Die Gymnospermen* (1890); *Das Reduktionsgesetz der Blüten* (1895).

CEL'ANDINE (OF. *celidoine*, Fr. *chélidoine*,

Lat. *chelidonia*, from Gk. χελιδόνιον, *chelidónion*, swallowwort, from χελιδών, *chelidón*, swallow), *Chelidonium*. A genus of plants of the family Papaveraceæ (the poppy family), having a corolla of four petals and a podlike capsule. The common celandine (*Chelidonium majus*) is a perennial, with pinnate leaves, lobed leaflets, and yellow flowers in simple umbels, frequent under hedges, in waste places, etc., in Great Britain and most parts of Europe. It is also introduced in various places in the United States. It flowers from May to September. The root, stem, and leaves, when fresh, have a disagreeable smell and are full of a yellow juice, which is very acrid, causing inflammation when applied to the skin. Celandine is sometimes used in medicine; it is a drastic purgative, and in large doses an active poison; in small doses it is said to act beneficially on the lymphatic system and on the organs of secretion, and to be useful in jaundice, scrofulous diseases, disease of the mesenteric glands, etc. The most prominent constituents of the plant are sanguinarin, chelerythrin, chelidonin, protopin, chelidoxanthin, and chelidonic acid.

CELANO, chà-lá'nò. A town in the Province of Aquila degli Abruzzi, south Italy, 25 miles south-southeast of Aquila (Map: Italy, H 5). It is situated on a hill at the north end of Lake Fucino (q.v.), the ancient *Lacus Fucinus*. It was the seat of a count and a place of importance prior to 1223, when it was devastated by Frederick II. The castle, founded in 1450, was the prison of Countess Covella, who was there immured by her son Rugierotto. The author of *Dies iræ, dies illa*, Beato Tommaso, was born in Celano. Pop. (commune), 1901, 9904; 1911, 1065.

CELAS/TRUS. See WAXWORK.

CELAYA, sá-lá'yá. A city in the State of Guanajuato, Mexico, 34 miles south of San Miguel de Allende, on the Río Grande de San Jago, at the junction of the Mexican Central and Mexican National railroads (Map: Mexico, J 7). It has a fine public square and the splendid church of Our Lady of Carmen, completed in 1798, which has a portico with handsome Corinthian columns and a spacious interior in the form of a Latin cross. The city manufactures soap, woolen goods, and saddles, and is noted for its candies. Near the city are thermal springs. Celaya was founded in 1570 and in 1655 was raised to the dignity of a city by Philip IV. It was sacked by the Revolutionists in 1810. Pop., 1895, 21,245; 1900, 25,565.

CELEBES (the name of a native tribe). One of the larger islands of the Dutch East Indies, situated east of Borneo between lat. 1° 45' N. and 5° 45' S. and between long. 118° 49' and 125° 5' E. (Map: East Indies, F 5). It is surrounded by the Celebes Sea on the north, the Molucca Sea on the east, the Flores Sea on the south, and the Strait of Macassar on the west. Its area is 69,273 square miles; including the dependent islands, 77,750 square miles.

In its shape Celebes is not unlike a starfish, the same general form being found also in the adjacent island of Gilolo. It consists of four mountainous peninsulas, of which the northern, Menado, has a length of about 400 miles. Its extraordinary conformation gives it a coast line of 3500 miles, which is longer than that of France and the Iberian Peninsula together. The surface is largely mountainous and reaches

one of its highest elevations in Mount Bon-thain, an extinct volcano, situated in the southern part of the island, 10,088 feet high. There are also a number of active volcanoes in the eastern end of the peninsula of Menado, ranging in altitude from 5000 to over 8000 feet. Most of the volcanoes, however, have reached the solfataric stage. The largest river is the Sadang, which rises in the central part of the island and flows through the southern peninsula. It is navigable by small boats, but most of the streams are mere mountain torrents. Lakes are abundant, and hot springs also are found. The west coast is without any very deep indentations, while the eastern and southern coasts have the three spacious inlets of the gulfs of Tomini, Tomori, and Boni.

The climate is tropical, but somewhat modified by the elevation of the surface and the influence of the sea. The rainfall is more abundant in the north than in the rest of the island. Lying in the centre of the East Indies Archipelago, Celebes has great tropical variety and wealth of both fauna and flora. Among the animals peculiar to the island are the tailless baboon, the babirusa, with upper canines curved backward and nearly touching the forehead, and shorter, curving lower canines, the marsupial cuscus, and the sapi-utan, or wild cow, besides several species of small birds. Deer, wild and tame buffaloes, wild swine, sheep, goats, etc., abound, and monkeys are innumerable. The forests include oak, teak, palm, cedar, and upas trees, while the bamboo, which furnishes material for habitations and every sort of implement, and even articles of dress, is everywhere found. Cloves, nutmeg, spices, the tropical fruits, maize, rice, tobacco, sugar, and indigo are easily raised. The coffee crop is not large, but of superior quality. The geological composition of Celebes is only slightly known. The larger part is probably composed of sandstone and limestone resting upon igneous rocks. The minerals of Celebes are gold, iron, salt, copper, zinc, and coal. The coal, however, is of poor quality. The gold is in quartz veins and occurs in deposits of sufficient richness moderately to reward the mining companies, of which there are several. The largest port, Macassar (pop., 26,000), at the south end of the island, commands most of the trade. The second port in importance is Menado (pop., 9000), on the north side of the northern peninsula.

For administrative purposes the northern arm, Menado (and Minabassa), is organized, with the Sangir and Talaut islands, into Residency No. XII, while the west, centre, and south of Celebes, with Sumbawa and other islands, are included in Residency No. XI or Insulinde, or Island India. Residency No. XIII includes eastern Celebes, Gilolo, and the Moluccas and other islands between Celebes and New Guinea. The princes of Celebes have pretty much their own way, being little interfered with by their Dutch residents as long as they pay tribute or bring forward the crops or forest products. Dutch missionary operations have been very successful in this island. The coffee plantations established on the mountain slopes by the Dutch about 80 years ago, together with the revival of cacao culture, have brought much wealth to the natives and their masters. No part of Insulinde has shown better the results of peace, good government, and missionary operations than certain portions of Celebes, especially Minabassa. Of late

years, apart from the business of the government, the imports in the ports, not including Macassar, have averaged over \$3,000,000 and the exports over \$3,580,000, the commerce of the port of Macassar reaching an annual total of \$6,400,000. The chief towns of the island are Macassar, Menado, and Gorontalo.

The population of the island is estimated at 2,000,000, including about 2400 Europeans.

All the natives of Celebes speak languages belonging to the Malay stock. That of the Minahassans in the northeast, however, differs notably from the tongues found in other parts of the island and shows considerable proximity to Philippine dialects, as proved by Professor Brandstetter in the Sarasins' monograph (see below). Culturally the northeast is likewise separated from the rest of the island taken as a unit. This linguistic and ethnographic result is confirmed by somatological study, according to which the Minahassans appear to be related to the Tagalog and other Philippine tribes and even suggest Japanese features. At all events, they may safely be regarded as alien immigrants from the north. So far as the remainder of the population is concerned, it may be positively stated that nowadays there are no traces of any Negroid or Papuan race. On the other hand, the Sarasin cousins distinguish the predominant Toradja type from the Toala, whom they regard as survivors of a very ancient migration from Asia. The Toradja are very closely related to the Dyak of Borneo, the Battak of Sumatra, and the Philippine Igorotes. They include the Bugi and Macassar of the southern peninsula of Celebes, who have indeed founded feudal monarchies and become affected by Mohammedan influence, but are nevertheless physically of the same stock with the pagan Toradja of the central region. The Toala are perhaps the most interesting of all the tribes of Celebes. They are of very short stature (males, 156.1; females, 145.4 cm.), have wavy hair, and present other traits proving kinship with the Veddahs of Ceylon and the Senoi of Malacca. Although somewhat Islamized, they preserve several cultural traits shared with these tribes, such as cave dwellings, ignorance of pottery and metallurgy, while an examination of their old caves by the Sarasins indicates, as further proof of connection, that the Toala were once economically dependent only on the chase and the collection of wild vegetables, and lacked all domestic animals save the dog. The Macassars practice Mohammedanism, much degraded by local superstitions and beast worship, and the abject fear of a local deity. Many are skillful craftsmen and excel in native manufactures, especially rich personal adornments. They have a literature, chiefly romance and drama, besides works of religion and law, translated from the Arabic and originally brought to them by the missionaries of Islam. In Menado 36 tribes were confederated, under Dutch direction, against an aggressive chief, and it is among these people, especially the Minahassans, that Dutch civilization has accomplished valuable results. The Javanese appear to have exerted not a little influence upon the southern portions of Celebes, and certain Hindu traces are also due to them as intermediaries. The women of Celebes are celebrated for the fine bark cloth made by them. Celebes has furnished many settlers for other regions of the Malay Archipelago, the Bugis, in particular, being great travelers

and colonizers, merchants, and seamen. The island was first discovered and named by the Portuguese in 1512, but from about 1607 the Dutch gradually obtained the supremacy, though it was not until well into the nineteenth century that every district was under their control. Consult: Lahure, *L'île de Célèbes* (Paris, 1879); Wallace, *The Malay Archipelago* (London, 1880); Van der Lith, *Nederlandsch Oost-Indie*, vol. i; Hickson, *A Naturalist in North Celebes* (London, 1889); Staden der Brink, *Zuid-Celebes* (Utrecht, 1884); Fritz and Paul Sarasin, *Versuch einer Anthropologie der Insel Celebes* (2 vols., Wiesbaden, 1905, 1906); id., *Reisen in Celebes* (2 vols., 1905).

CELERY. One of the two architects—the other one is Severus—mentioned by Tacitus as employed by the Emperor Nero in his great constructive works. They undoubtedly carried out Nero's scheme for a general reconstruction of Rome on a regular plan after the great fire, and were the architects of his colossal "Golden House," the most immense of all Imperial palaces, which swallowed up a large quarter of the city.

CELERYES. See LEGION.

CELERYPEDE. See BICYCLE.

CELERY (Fr. *céleri*, Lat. *selinon*, parsley, from Gk. *σέλινον*, *selinon*, parsley) (*Apium graveolens*). A biennial plant of the family Umbelliferae, a native of Europe, now widely cultivated for its leafstalks, which are blanched and eaten raw with salt. One form, celeriac, is extensively grown on the continent of Europe for its turnip-like root. The whole plant has an aromatic flavor.

The celery industry has had a rapid development in the United States during recent years, owing largely to improved methods of culture and transportation. Florida and California now contribute a large supply of late celery to the leading markets. The method of culture now in general use is to sow the seed in a hotbed, or for the late crop, in the open, transplant once or twice, and set in the field in level rows 3 or 4 feet apart and 6 inches distant in the row. Celery intended for summer or fall use is blanched when the plants are well grown by setting up boards about a foot wide against the row on either side; that grown for winter use is blanched by heaping earth against the plants. It is taken up when cold weather comes on and set in pits or a cool cellar, the roots being packed in moist earth so that the plants may continue a slow growth while blanching. In the so-called "new celery culture" the rows are only 6 to 12 inches apart. The plants thus thickly grown are self-blanched and only the outside rows need protection from the light. Celery is generally grown on a moist, rich, peaty soil, well drained and heavily fertilized; but good crops have been grown on fertile clayey and sandy uplands. The crop requires an abundance of moisture and fertilizer. *Celeriac*, or the root form of celery, is handled about like celery, except that it does not require blanching. It is little grown in America except where there is a German settlement. It is cooked and eaten with sauce, used in salads, and pickled. For illustration, see Plate of SALAD PLANTS.

Some 60 varieties of celery are cultivated in the United States. Some are dwarf varieties, scarce 1 foot high, while others grow nearly 3 feet high. The leaves may be green, white, or yellow. Paris Golden or Golden Self-Blanching,

White Plume, Giant Pascal, and Boston Market are among the varieties that are most extensively grown.

Celery Diseases. Celery is subject to a number of destructive parasitic diseases. The rust or sun scald, due to *Cercospora apii*, is recognized by the gray or yellow spots upon the leaves. The spots enlarge, run together, and finally destroy the leaf. The disease is more prevalent in dry situations than in moist ones, and where celery is grown in very dry soils it should be given some shade to prevent this disease. A leaf blight, caused by *Septoria petroselinæ apii*, attacks all parts of the plant above the ground, causing watery spots on stems and leaves. Black dots soon appear in these areas and the spores are widely scattered. Attention should be given to plants when setting them out that no diseased ones are used. If the plants are sound when planted, any good fungicide will prevent the spread of either of the above diseases. Damping off is especially troublesome in the South and in seed beds elsewhere. It is due to soil fungi and is favored by too much moisture, overcrowding, etc. A bacterial disease is said to attack some varieties, causing their stalks to become watery and worthless. It also spreads in market, quickly causing the hearts to melt away into a slimy, worthless mass. In the market celery should be kept very dry or else completely submerged in water to prevent this loss.

Consult: Duggar and Bailey, "Notes upon Celery," in *Cornell University Agricultural Experiment Station Bulletin 132* (Ithaca, 1897); Massey, "Growing Celery in the South," in *North Carolina Agricultural Experiment Station Bulletin 83* (Raleigh, 1892); Beattie, *Celery Culture* (New York, 1907).

CELESTIA. A musical instrument invented by August Mustel, of Paris, in 1886. Upon wooden resonators are fastened steel plates struck by hammers manipulated by means of a regular keyboard like that of a piano. The tones are of crystalline purity and have an ethereal quality. The range of the instrument is five octaves, from c^4 to c^5 . In order to avoid the use of many leger lines the music is always written an octave lower than the actual sound. R. Strauss, Tschaiowsky, Puccini, Mahler, and other composers have employed the celesta in some of their scores with much success.

CELESTIAL CITY. In Bunyan's *Pilgrim's Progress*, the goal of the pilgrim's journey, which was reached by passing through the River of Death.

CELESTIAL EMPIRE, THE. An appellation for China, suggested by the title "Tien Chao" (Heavenly Dynasty), which the Chinese give to their country; whence, also, the term *Celestials*, often popularly applied to the population. See CHINA.

CELESTIAL MOUNTAINS. See TIAN-SHAN.

CELESTINA, thä'lës-të'nä. A Spanish prose drama in 21 acts, originally entitled *The Tragic-Comedy of Calisto and Melibœa*, probably begun by Rodrigo Cota, of Toledo, about the middle of the fifteenth century. It was finished by Fernando de Rojas and appeared about 1480. Consult Ticknor, *Spanish Literature* (Boston, 1863).

CEL/ESTINE. The name of five popes. 1. CELESTINE I, Pope 422-32, is supposed to have been a near relative of the Emperor Valentinian. Tradition attributes to him the addition to the

Angelical Salutation: *Sancta Maria, Mater Dei, ora pro nobis*. He sent Palladius to Ireland as the first bishop of that country. 2. CELESTINE II (Guido di Castello), Pope 1143-44. He gave absolution to Louis VII of France, on the King's humble subjection, and removed the papal interdiction from that country. 3. CELESTINE III (Giacinto Bobone Orsini), Pope 1191-98. He is supposed to have been 85 years old when chosen. He crowned the Emperor Henry VI of Germany and subsequently excommunicated him for keeping Richard I of England in prison. In 1192 he confirmed the statutes of the Teutonic Order of Knights. 4. CELESTINE IV (Goffredo Castiglione of Milan). A nephew of Urban III. He was elected Pope by only seven cardinals, Oct. 25, 1241, and died November 10 of the same year. He was the author of a history of Scotland, in which country he was once a monk. 5. CELESTINE V (Pietro di Morone), Pope in 1294. He was the son of a peasant of Naples, became a Benedictine monk, and lived many years in caves, after the manner of John the Baptist. Terrible stories are told of the severity of his penitential discipline. During his hermit life he founded the order that bears his name. (See CELESTINES.) After the death of Nicholas IV he was elected Pope, but refused to accept until persuaded by a deputation of cardinals, reinforced by the Kings of Naples and Hungary. He was chosen July 7, 1294, and was crowned August 29. He issued two decrees, one confirming that of Gregory X ordering the shutting up of the cardinals when in conclave, and one declaring the right of any Pope to abdicate at pleasure—a right which, after ruling five months and eight days, he exercised himself, Dec. 13, 1294. In his document of renunciation he assigned as the moving causes "the desire for humility, for a purer life, for a stainless conscience; the deficiencies of his own physical strength; his ignorance; the perverseness of the people, and his longing for the tranquillity of his former life." Having divested himself of every outward symbol of dignity, he returned to his old solitude; but he was not permitted to remain. His successor, Boniface VIII, sent for him, and, fearing a schism on his behalf, confined him, though with great respect, in the castle of Fumone, where after 10 months he died, May 19, 1296. He was canonized in 1313. Some hold that Dante places him in hell, in the famous passage: "I looked, and I beheld the shade of him who made through cowardice the great refusal" (*Inferno*, iii; and cf. xxvii); but it is not certain that the reference is to Celestine.

CELESTINES. A congregation within the Benedictine Order, founded by Pietro di Morone about 1254, and confirmed by Urban IV in 1264 and 1274. They were known at first as Hermits of St. Damian, but called themselves Celestines when their founder ascended the papal chair under the name of Celestine V. They wore a white garment with black hood and scapular and lived a purely contemplative life. In the thirteenth and fourteenth centuries the order rapidly spread through France, Italy, and Germany, but subsequently decayed. The German convents were mostly destroyed by the Reformation, and the French by the Revolution.

CELESTITE (Lat. *cælestis*, of the sky, then blue, from *cælum*, sky). A strontium sulphate that crystallizes in the orthorhombic system. It is of a white color, though usually with a

faint blue tinge (from which it derives its name) and rarely reddish. The finest crystals are those from Girgenti in Sicily, where it is found with sulphur and gypsum, and from the Put-in-Bay Islands in Lake Erie. It has considerable commercial value as a source of strontium, many of whose salts are used for producing a red light in fireworks. *Barytocelestite* is a variety containing barium, and *calciocolestite* is a variety containing calcium.

CE/LIA. 1. Mother of Faith, Hope, and Charity in Spenser's *Fæerie Queene*. 2. Daughter of the usurper Frederick, and devoted cousin of Rosalind, in Shakespeare's *As You Like It*.

CELIBACY (from *celibate*, Fr. *célibat*, Lat. *celibatus*, celibacy, from *cælebs*, bachelor). In ecclesiastical history, the abstention from the married state by the clergy and those who have entered upon the monastic life. The Roman Catholic church requires celibacy on the part of its clergy as a part of its ecclesiastical discipline. It holds that this practice is sanctioned, though not required, by the New Testament, basing this claim upon what it avers to have been the constant tradition of the Church and upon several biblical texts. Catholic writers make a careful distinction between the principles upon which the law of celibacy is founded and the changes which have taken place in its application. These principles are: (1) that the clergy may serve God with more freedom and with undivided heart, and (2) that, being called to the altar, they may embrace the holier life of continence. This does not imply, it is declared, that matrimony is not a holy state, but simply that celibacy is a state of greater perfection. Matt. xix. 12, 1 Cor. vii. 32-40, and Rev. xiv. 4 are cited in support of this contention: while the reference in 1 Tim. iv. 3 is taken as clearly directed against Manichæan reprobation of marriage in general. It does not follow, however, that the Church is absolutely bound to impose a law of celibacy upon its clergy.

In Apostolic times there seems to have been no legislation in regard to clerical celibacy. In the second century the veneration for the virginal life had become widespread, and a continent life for the clergy was regarded as proper to the ecclesiastical office, at least in its major orders. The rule for clerics not to marry after ordination seems to have been in force from very early times, for we find Paphnutius, an Egyptian bishop at the Council of Nicæa (325), while resisting the imposition of a law of continence upon all clerics, declaring the ancient traditional law forbidding clerics to marry after ordination to be sufficient. That this was the recognized practice of the early Church seems well established. The Apostolic Constitutions forbid bishops, priests, and deacons to marry, and the twenty-seventh Apostolic canon contains the same prohibition. The Council of Neo-Cæsarea (between 314 and 325) decreed that a priest who married after ordination should be degraded to the lay state. A deacon could marry only if he had stipulated for such liberty at the time of his ordination, as provided for by the Council of Ancyra in 314. The Council of Elvira (305) legislated against the marriage of all those who served the altar in any way, requiring of bishops, priests, and minor clerics a life of continence, even if they had been already married. It was the application of this law throughout the entire Church against which Paphnutius protested at the Council of Nicæa. Nevertheless, it soon

afterward prevailed in the West. We find it so declared in a letter of Pope Siricius (384), addressed to Himerius, Bishop of Tarragona. The Third Synod of Carthage (397) embodied it in its canons. Pope Innocent I laid it down in his letter to Exuperius, Bishop of Toulouse, who had consulted him in regard to it. St. Jerome (*against Jovinian*) declares that a priest who has "always to offer sacrifice for the people must pray, and therefore always abstain from marriage." Leo, and Gregory the Great, and the Eighth Council of Toledo renewed the prohibitions against the marriage of subdeacons.

The strict enforcement of the law of celibacy in the pontificate of Gregory VII has occasioned much dispute. Protestant writers generally, such as Mosheim, Potter, and Ranke, condemn the action of Gregory as an innovation upon ancient discipline. Catholic writers defend this pontiff, and hold that Gregory's legislation was but the application of the ancient discipline with renewed vigor. There is no doubt that in Gregory's time concubinage was largely prevalent. His immediate predecessors, Leo IX, Nicholas II, and Alexander II, issued stringent decrees against it. But it was Gregory who most vigorously and successfully enforced this legislation. Priests living in concubinage were forbidden to say mass or even to serve at the altar; the faithful were warned not to hear their mass, and deposition was to be the punishment of priests who refused to obey. A series of synods from the beginning of the twelfth century declared the marriage of persons in holy orders to be not only unlawful, but invalid. It was now laid down that if persons in minor orders married they forfeited the privileges of the clerical state. However, Boniface VIII (1300) permitted them to act as clerics, if they had been married only once and then to a virgin, had episcopal permission, and wore the habit of clerics. The Council of Trent renewed this law and again decreed the marriage of clerics in holy orders null and void. In the Western church at the present time holy orders can be conferred on a married man only on the condition that his wife voluntarily and fully consents to a separation, and herself makes a vow of chastity.

The law of celibacy has never been so stringently applied in the East as in the West. Socrates (450) states that the same law of celibacy which prevailed among the Latins also obtained in Thessaly, Macedonia, and Achaia. In 620 the Trullan Synod enacted a decree which required married bishops to separate from their wives and forbade all clerics to marry after entering upon the subdiaconate. In the ninth century a law of Leo the Wise permitted subdeacons, deacons, and priests who had married after receiving orders to remain in the ranks of the clergy, but not to exercise any functions pertaining to their office save in matters of administration. The Russian church has modified the ancient Greek canons prohibiting priests and deacons from marrying after ordination. Up to the time of Peter the Great a priestly widower was obliged to enter a monastery, but this monarch allowed a second marriage, and permitted the man to be employed in a seminary or episcopal chancery. The common custom in the Greek church demands that the secular clergy shall be married once, but, if the wife dies, not a second time. The bishops are usually taken from the celibate monks. Among the United Greeks, Ruthenians, Maronites, and such other

followers of the Oriental rites, in communion with Rome, the following is the discipline: 1. A bishop cannot, after his consecration, either marry again or cohabit with the wife married before ordination. If he has a wife living, she must retire to a distant nunnery, and there be supported by her late husband. 2. Priests and deacons may, in accordance with the Trullan canon, keep the wives taken before their ordination, but they must abstain from marital intercourse for some time before officiating at the altar. Pope Clement VIII (1592-1605) ordered this abstinence to be if possible for seven, or at least for three days. 3. Priests and deacons cannot marry after ordination. Such was the decree of Benedict XIV issued May 6, 1742. Any such attempt at marriage was pronounced null and void. But in the case of converts from schism who were already in holy orders, the same pontiff decreed that the Holy See might permit the retention of a wife taken after ordination.

Celibacy has no doctrinal bearing in the Roman Catholic church, and is regarded as purely a disciplinary law, though as of prime importance in maintaining the character and dignity of the priesthood. Often a dispensation (q.v.) from the obligation of celibacy has been accorded to ecclesiastics under exceptional circumstances, which seemed to warrant a departure from the general law. These circumstances were very often connected with the necessity of providing heirs for noble families which were in danger of becoming extinct. Among others, the following may be mentioned: In 1040 Benedict IX dispensed Casimir, a monk of Cluny, for the sake of the Polish succession. Constance, daughter of King Roger of Sicily, was dispensed from her vows as a nun by Celestine III in 1191 in order to marry the Emperor Henry VI. In 1648 Innocent X dispensed a Jesuit father, John Casimir, who had been elected King of Poland, from the obligation of celibacy in order again to preserve the succession. In modern days the only instance of a validation of priestly marriages is that by Pius VII in the case of the French *Constitutionnels* (the priests who had accepted the civil constitution of the clergy and for a time had been practically separated from Rome), receiving back into regularity, on their submission, those who had married during the Revolution. Dispersations are quite numerous in cases of persons belonging to the military religious orders.

The celibacy of the clergy was rejected by the Protestant reformers. Luther set the example to his followers by marrying a former nun; and both the marriage of ministers and the abolition of monastic vows became a common feature of those bodies which threw off their allegiance to Rome. The Church of England in its articles of religion laid down the proposition that "bishops, priests, and deacons are not commanded by God's law, either to vow the estate of single life, or to abstain from marriage; therefore it is lawful for them, as for all other Christian men, to marry at their own discretion, as they shall judge the same to serve better to godliness." Consult: Schmitt, *Der Priesterölibat* (Münster, 1870); Lea, *Historical Sketch of Sacerdotal Celibacy* (Philadelphia, 1886); Carry, *Le Célibat ecclésiastique devant l'Histoire et devant la Conscience* (Paris, 1905).

CELINA. A village and the county seat of Mercer Co., Ohio, 118 miles north of Cincinnati,

on the Cincinnati Northern, the Lake Erie and Western, the Western Ohio, and the Cincinnati, Hamilton, and Dayton railroads, and on the Grand Reservoir (Map: Ohio, A 4). It has a Carnegie library and manufactories of carriages, furniture, etc. The water works and electric light plant are owned by the village. Pop., 1890, 2702; 1900, 2815; 1910, 3493.

CELL (Fr. *celle*, Lat. *cella*). The general meaning, with the Romans as with us, was that of a storeroom or small apartment where objects of any kind were stowed away; the Latin *cella*, however, does not denote a subterranean storeroom, as does the English cellar. *Cella* was also used to denote the inner room of an ancient temple (Greek *vab*s), where the image of the god was placed. In modern architecture, the term "vaulting cell" signifies the hollow space between the principal ribs of a vaulted roof.

CELL. In early Christian usage, (1) a chapel erected over a tomb; or (2) a monastic dwelling either of a single monk or of a community subordinate to an abbey and compelled to pay tithes to it. Its occupants were obliged to present themselves at the abbey at stated times.

CELL (in animals). The morphological and physiological visible unit of the body of organisms. It is essentially the same in plants and animals and is usually of microscopic size. The yolk, or yellow, of a hen's egg is, however, one cell. The name "cell" is something of a misnomer, for it implies a wall-enclosed chamber. But though many cells, especially among plants, are provided with thick walls, these may be entirely absent, and, when present, are usually, in animals at least, exceedingly delicate. Consequently, we regard the cell wall as of less importance than the cell contents, which constitute the more active parts. The cell content is known as protoplasm. The protoplasm consists of two main parts—a centrally placed, usually more or less spherical or ellipsoidal body called the nucleus, and the rest of the protoplasm, called cytoplasm. Nucleus and cytoplasm are each dependent on the other, and both are necessary to cell life. The nucleus is easily distinguished by the circumstance that it contains much substance which is easily stained by various dyes. This stainable substance is known as chromatin. The cytoplasm usually contains relatively large water-filled spaces, called vacuoles, and small particles of food substance and other substances that are easily "stained," i.e., seize upon the coloring matter of dyestuffs when placed in them. In its general structure protoplasm consists typically of water and the truly vital substance called plasma. The plasma exists in a great variety of forms. Frequently it occurs in films surrounding little vesicles of water, as the films of foam surround air spaces, or as the wax of the honeycomb surrounds the honey. Sometimes it seems to extend in fine threads through the water spaces. Still, again, the water spaces may be almost entirely absent. The living, "active" protoplasm seems to be constantly in motion, as can be judged by the motion of the particles which flow in the transparent current. Besides these particles, larger masses, such as drops of oil, pigment bodies, food granules, and excretory bodies, may be seen in the plasma or lodged in the water spaces between the plasma walls.

The cell wall, or cell membrane, is produced

by the cell itself, usually by a transformation of its own substance. It is frequently, at least, to be regarded as still made up of living matter. In many cases, when the cell wall is thick, it can be seen to be perforated to permit of the passage of films of protoplasm by which the adjacent cells are organically connected. In plants where a great weight has to be borne and great rigidity given, the cell wall often gains a great thickness and constitutes the wood of the dead plant.

The *nucleus* is essential to the processes of assimilation and growth and probably controls in these operations. While its general form is subspherical, it may become greatly elongated, lobed, branched, form a series like a string of beads, or appear as two bodies or even as a mass of chromatin, scattered throughout the cell. In the chromatin network lie the chromatic particles and certain larger bodies called nucleoli. There may be many nucleoli, or only one large one. The typical nucleolus is regarded as an excretion product which is eventually cast out of the nucleus. The plasma films separating the nucleus from the cytoplasm are usually very evident, and, taken together, constitute the so-called nuclear membrane. It is of course a living membrane. Outside of the nuclear membrane is often found a minute particle, the centrosome.

Cell Division. The method by which the multicellular body is produced from the unicellular egg was long misunderstood. It was thought that cells crystallized out of a homogeneous matrix, or that new cells were formed inside of the preexisting cells. It is now known that there is one process of cell multiplication and one only, viz., division of a cell into two equal parts. This division involves all parts of the cell—cytoplasm, nucleus, and centrosome. The method of cell division varies in different cases; two main types may, however, be distinguished—mitotic division, or "karyokinesis," and amitotic division. The mitotic division seems to be the more usual type; so it may be first considered. For purposes of description, four series of stages or phases may be recognized: (1) the prophase, or preparatory changes; (2) the metaphase, or acme of the division process; (3) the anaphases, or aggregation of nuclear material at the centres; (4) the telophases, or those in which the cytoplasm divides and the two new nuclei are established.

(1) *Prophases*.—In the cytoplasm the centrosome becomes double, if not so already, and the two centres move apart. A set of radiations now make their appearance in the cytoplasm—the asters—having the centrosomes at their centres. Between the centrosomes the asters pass over into each other, making a spindle-shaped figure composed of lines—the karyokinetic spindle. At the same time changes are occurring in the nucleus. The chromatin, which has previously consisted of scattered particles, becomes condensed into a deeply staining thread, which is coiled as a twisted or spiral thread within the nuclear membrane (skein or spireme stage). Eventually this thick thread, from which the mitotic process takes its name (Gk. *ulros*, a thread), breaks into a number of deeply staining rods (centrosomes). The number of centrosomes is believed to be constant in each species throughout the whole series of cell divisions in the individual, and is always even. In the threadworm (*Ascaris*) there are 2 or 4 chromo-

somes; in certain liverworts, 8; in certain insects, 12, 16, 20, etc.; in the frog and mouse, 24; in the crustacean *Artemia*, 168; in man, probably 16. The nucleoli are either cast out into the cytoplasm or are gradually dissolved in place.

(2) *Metaphase*.—In this phase the spindle has come to lie in the equator of the nucleus, and the nuclear membrane has disappeared. Each chromosome splits lengthwise in equivalent parts, one-half of each going towards each pole. Consequently, each of the daughter nuclei receives exactly equivalent portions of the chromatic substance of the mother nucleus.

(3) *Anaphases*.—The separated parts of the chromosomes move to the two poles of the spindle, and these group themselves closely together. For a time the spindle fibres still persist as fine threads connecting the chromosomes, and in the middle of their course a plate of fine granules often appears lying across the fibres. The asters fade away, and the process of nuclear division is accomplished.

(4) *Telophases*.—The whole cell now divides, the division plane passing through the plate of granules, which plate helps form the new cell wall. The chromatophores seem to absorb water, swell up, press against each other, and form spherical nuclei. Alongside each nucleus is found the centrosome of the new cell. What are the purpose and the mechanism of mitosis? The purpose is quite certainly the exact division of the chromatic material. Concerning the mechanism there is still much difference of opinion. It seems probable that currents in the plasma films convey the chromosomes from each other and towards the opposite poles. The division of the cytoplasmic body may result from a centripetal flowing towards the centres of the two asters. But we are ignorant of the causes which determine the direction of flow.

Amitotic Division. This consists of a constriction of a nucleus without any formation of chromosomes. After two nuclei are formed the cytoplasmic body may divide. The significance of amitosis is very uncertain. It is especially common among cells that are about to perish; it seems to be induced by peculiar conditions of the cytoplasm.

The History of the Cell Theory. The first investigations into the finer structure of organisms were made by Malpighi and by Grew, at the end of the sixteenth century, upon plants. They discovered in them small, fluid-filled spaces with firm walls. But it was not until the early part of the nineteenth century that the general notion that the whole body of the higher organisms was composed of a mass of cells was gained. This generalization became established by Schleiden and by Schwann in 1838. The importance of the cell contents was not at first appreciated, but when they were found in constant motion in the live plant cell (Corti, 1772, and Treviranus, 1807), the idea that they were the essential living substance came to prevail. The name "protoplasm" was first assigned to the cell contents by Mohl (1846). Gradually, as cells without walls were discovered, the idea of cell took on this form—a mass of protoplasm possessing a single nucleus.

The chemical composition of protoplasm throws little light on vital action, although vital action is a chemical process. The reason is that the form of the molecules rather than the quantitative analysis or the enumeration of the

elements is at the basis of life. Carbon, hydrogen, oxygen, nitrogen, are always present, and sulphur, phosphorus, potassium, and certain other alkalies and metals are usually found in small quantities. The dead protoplasm consists chiefly of albuminous substances, including nuclein, 34 per cent; lecithin and fats, 14 per cent; various albuminoids, 14 per cent; and, for the rest, numerous other substances.

Cell Activity. Cells, apart from the process of division, show active processes in their protoplasm, especially by their capacity for movement and response to stimulus. Cell movement takes on diverse forms according to circumstances. In naked, free cells, like the amoeba, the most evident movements are the throwing out of blunt, finger-like processes (pseudopodia). If one of these takes the lead, it determines the direction of locomotion of the whole cell, for the rest of the body flows into the pseudopod. Often the pseudopodia are numerous and extremely fine; under these circumstances minute particles may be seen streaming in the current of the protoplasm which moves along the thread. In the case of cells with a firm wall, the protoplasm often streams in fine threads through the fluid-filled cell space, or in other cases a marvelous rotatory movement is seen. The causes of protoplasmic movement are not altogether clear. Recently, however, attention has been called to the fact that other foamy masses—especially a drop of oil filled with vesicles of water—will send out pseudopodium-like processes. So that the constant movement of the protoplasm may be the physiological concomitant of its unstable structure. Other forms of cell movement are the lashing of whips (flagella) or little hairs (cilia) covering the free swimming cell (Protozoa and Protophyta).

Response to Stimulus. Irritability is a fundamental property of protoplasm, so we find it present in unicellular organisms and in the tissue cells. Protoplasm is active only within certain limits of temperature, beyond which quiescence—heat rigor or cold rigor—occurs. Protoplasm (of Myxomycetes) will flow with reference to a source of heat—towards that temperature to which it is most "attuned." The direction of light rays may also determine the direction of locomotion. When a ray of white light passes obliquely through an amoeba, the latter moves from the source of light. Also, the chlorophyll bodies of a leaf will move away from the surface which is too intensely illuminated. Likewise the electric current, gravity, contact, and chemical agents may awaken definite responses in cell protoplasm.

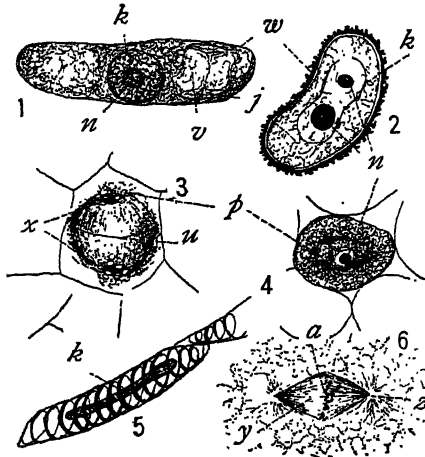
The forms assumed by cells are most diverse. In the animal's body they are united to form tissues, and the cells of each kind of tissue have their peculiar form. The cells of the skin are flattened or cuboidal; those lining the food canal are columnar; muscles are composed of elongated compound cells, and nerves give rise to processes that may be 2 feet or more in length. These kinds of cells will be considered under **HISTOLOGY**.

The Germ Cell. The egg and the spermatozoön, the union of which is the initial act in sexual reproduction, are each single cells, derived, like the other cells of the body, by the division of preëxisting cells. The two kinds of germ cells are, however, very different in appearance and function. The egg cell (ovum) is of great size, due to the fact that it is stuffed full

of food material, the so-called yolk. The nucleus is large, and is commonly called the germinative vesicle, and in its open-meshed films the chromatic material is lodged. The entire egg is often inclosed in one or more envelopes for its protection. The spermatozoon is of extremely small size. It is typically a threadlike cell, enlarged at one end to form the head. Behind the head is the middle piece, followed by the lash or tail. The head contains the nucleus, which is here dense, without water, but consisting almost wholly of chromatin. The middle piece seems to contain the centrosome. The outer envelope of head and middle piece and the whole of the tail are cytoplasmic, and play only an incidental part in the fertilization of the cell. See FERTILIZATION.

Consult: E. B. Wilson, *The Cell in Development and Inheritance* (2d ed., New York, 1900); O. Hertwig, *Die Zelle und die Gewebe* (Jena, i, 1893; ii, 1899; Eng. trans., New York, 1900); Calkins, *The Protozoa* (New York, 1901); Farmer, in Lankester's *Treatise on Zoology*, Protozoa, part i, fasc. 2 (London, 1903); Gurmitsch, *Morphologie und Biologie der Zelle* (Jena, 1904); Hertwig, "Ueber neue Probleme der Zellenlehre," in *Proc. Seventh Inter. Zool. Congress* (Boston, 1912).

CELL (in plants). In its most fundamental characters the plant cell closely resembles the animal cell. Like that, it possesses a nucleus and cytoplasm, and may or may not be surrounded by a cell wall. Nearly all cells are microscopic in size, a fair average being about 0.004 to 0.002 inch in diameter. Some cells, however, become much elongated, bast cells over 0.2 inch in length having been reported, and the internodal cells of *Chara* sometimes reaching a



CELL: 1, a cell showing wall (w), cytoplasm (j), vacuoles (v), nucleus (k), and nucleolus (n); 2, cell with heavy wall (w), and an elongated nucleus (k) with two nucleoli (n); 3, cell in late stage of division, paranucleus (p), chromosomes (x), equatorial plate (u); 4-5, same lettering; 6, a spindle showing centrospheres (x), spindle fibres (y), and chromosomes (a).

length of 2 inches. On the other hand, the cells of the yeast plant are only 0.00032 inch in diameter, and the bacteria are much smaller. When cells are free, there is a tendency to assume the spherical form, and this is the most usual shape in one-celled plants; but where the cells are aggregated into tissues various modifications are met, the cells becoming compressed, elongated, flattened, star-shaped, etc.

In all except a few of the lowest plants the cell has a wall of cellulose, a substance derived from the protoplasm. As growth proceeds, the original wall of cellulose may become modified, the various changes being called lignification, suberization, etc. In spores the outer portion of the wall usually develops spines, furrows, and various sculpturings, that are sufficiently constant to be of value in classification. The internal modifications of the cell wall are no less numerous and striking. Sometimes there is a uniform thickening, but more commonly the thickening is irregular and results in the appearance of striations, spirals, rings, reticulations, and different forms of pits.

Contents. The most important contents of the cell are the nucleus and the cytoplasm, but besides these various other things may be present, such as plastids, starch grains, crystals, oil drops, sap, etc. *Plastids* are differentiated portions of the cytoplasm, and it has been believed by many that they are permanent organs of the cell, passed on from one cell generation to another, and it is undoubtedly true that they divide and may persist throughout the greater part of the life history of a plant; but whether they are present in the initial cell of the plant or not is a serious question, and if not, it must be admitted that they may be formed *de novo* from the cytoplasm. Colorless plastids are called "leucoplasts," and colored ones "chromatophores." If a chromatophore contains chlorophyll (the green pigment) it is called a "chloroplast," but if it contains any other coloring matter it is a "chromoplast." The function of the leucoplast is to produce starch, but if light conditions are favorable the leucoplast may be converted into a chloroplast. Chloroplasts vary greatly in form, in size, and in the number found in a single cell. In the higher plants they are small flattened or discoid bodies, and many are usually found in a single cell. However, in *Anthoceros* (a liverwort) and *Selaginella* (little club mosses), there is only one in a cell. The greatest variety of forms is found among the seaweeds (*Algæ*), where there are not only the small discoid forms, but also flattened plates, coiled bands, etc. The chloroplasts, like the leucoplasts, produce starch, but they are also able to manufacture carbohydrates in the presence of light (photosynthesis, q.v.). *Starch grains* vary in form and size. While the size may vary greatly with age, the form is usually characteristic of a given plant. The starch formed by the chloroplasts is in the form of very small granules, which do not become large grains, but disappear when light is removed, and are probably carried to other portions of the plant. The ordinary starch grains are developed in plastids. *Crystals* composed of calcium oxalate are widely distributed. In form they are prismatic, cubical, octohedral, acicular, etc. Those which are needle-like in form are called "raphides." Cystoliths composed of calcium carbonate are much less common.

Cytoplasm and Nucleus. These are the living portions of the cell. So far as known, there is no difference in the structure of the cytoplasm of animal and plant cells. The nutritive portion of the cytoplasm has been termed the "trophoplasm," and the threadlike portions which are particularly concerned in cell division and other phenomena of motion are called "kino-plasm." The bounding ("limiting") layer of the cytoplasm is called the "Hautschicht." While

cells are young, the cytoplasm fills the entire space between the nucleus and the cell wall, but as the cells increase in size vacuoles (apparently empty spaces) appear, and the cytoplasm merely forms a wall layer connected with the nucleus by constantly shifting strands.

Nucleus. The nucleus is an exceedingly complex structure. An undoubted nucleus has been demonstrated in all groups of plants except in the bacteria, and even here nuclei are being reported. From the seed plants down to the algae a single nucleus in a cell is the rule, but there are many exceptions. The absolute size of nuclei is exceedingly variable. As a rule, it may be said that large cells have large nuclei. The nuclei of reproductive cells are generally larger than those of the vegetative cells of the same plant. The nuclei of the lilies, orchids, and conifers are usually large, while those of mosses and dicotyledons are small. For example, the nucleus of the egg of the common Austrian pine (*Pinus laricio*) can be seen with the naked eye, being 0.006 inch in diameter, and the nucleus of the egg in some cycads reaches a diameter of 0.02 of an inch; while the nuclei of some of the fungi are scarcely 0.00008 inch in diameter. The nuclei of the lilies, which are seldom more than 0.002 inch in diameter, may be regarded as unusually large, and they have been studied more than any other plant nuclei.

Form of Nucleus. The nucleus in young cells is usually spherical, but as cells grow older its form may change in innumerable ways. When cells become elongated, as in the development of vascular tissue, the nuclei may also elongate, the length becoming 100 times as great as the breadth. In the mucilaginous sap of some amaryllises nuclei have been observed in which the length had become more than 5000 times as great as the breadth. In the endosperm of Indian corn the nuclei acquire remarkable reticular forms, while in some of the stonecrops (*Sedum*) they become variously lobed. In some pollen grains one of the nuclei becomes so amoeboid in form that it is easy to believe that it may be capable of amoeboid movements, and in one of the slime molds such movements have actually been observed.

Division of Nucleus. It is accepted that a nucleus never arises *de novo*, but only by the division of a preexisting nucleus. The principal structures concerned in division are the chromosomes, the spindle (achromatic figure), and, in some plants, the centrosome. The last structure, however, is not so constantly present as in animals, and many believe that it does not exist at all in the fern plants (pteridophytes) and seed plants (spermatophytes). In the cells which produce pollen grains the spindle first appears as a web of fibres surrounding the nucleus, which become grouped into cones forming a multipolar spindle, that gradually becomes bipolar. In ordinary vegetative cells the spindle is bipolar from the start, making its appearance as a pair of dome-shaped caps at opposite poles of the nucleus. The chromatin is generally regarded as the most important part of the nucleus, as it is believed to be the morphological basis of heredity. During division the chromatin assumes the form of a narrow band which divides into a definite number of more or less elongated pieces, the chromosomes. The number of chromosomes is constant in a given species, and the number in the sexless generation (sporophyte) is always double the number found in

the sexual generation (gametophyte). The reduction in number takes place during the formation of spores. When the nucleus of the sperin fuses with that of the egg, the double number is restored. The splitting of the chromosomes in the vegetative divisions, and perhaps also in the divisions concerned in the reduction of chromosomes, is longitudinal. Some of the fibres of the spindle become attached to the chromosomes, half the number being drawn to one pole and half to the other, while a series of granules, the beginning of a new cell wall, appears on the fibres which stretch between the young nuclei. The wall becomes completed as the fibres disappear. In the formation of the endosperm of seeds, and in some other cases, nuclear division may take place without being followed by the formation of a cell wall—a phenomenon called free nuclear division. See FERTILIZATION; CYTOLOGY.

CEL/LA (Lat., cell). The name applied to the central chamber, or *naos*, of a Greek or Græco-Roman temple. See CELL; TEMPLE.

CELLAMARE, thāl'ya-mă'ră, ANTONIO DEL GIUDICE, DUKE OF GIOVENAZZO, PRINCE OF (1657-1733). A Spanish diplomat, born in Naples, a grandee of Spain, son of the Duke of Giovenazzo, and nephew of the Cardinal del Giudice. He was trained at the Spanish court and during the War of the Spanish Succession was an active partisan of Philip V. In 1715 he was appointed Ambassador to France, where he was the leading figure in the conspiracy to effect the overthrow of the Duke of Orleans and obtain the French regency for Philip V. Although the plot was discovered in time to prevent its being carried out, the discovery brought to light such high offenses against the government of the regent that the latter was obliged to declare war on Spain, Jan. 9, 1719; a war which was disastrous for Philip V. When arrested, Cellamare appealed to the Corps of Diplomats to save his house from being examined by the authorities, but the Diplomats declined to interfere, as they recognized that the French government was acting well within its rights, and even generously, since, instead of keeping Cellamare in prison it conducted him to the frontier and set him at liberty. Consult Martens, *Causes célèbres du droit des gens* (2d ed., Leipzig, 1861).

CELLARIUS, CHRISTOPH (1638-1707). A German classical scholar; born in Schmalkalden (Hesse-Nassau). He was educated at the universities of Jena and Giessen and, after holding posts as instructor or rector in various gymnasia, was appointed professor of history and eloquence at Halle in 1693. By his manuals he promoted the knowledge of ancient grammar, style, geography, and history, and by his editions of Latin authors greatly encouraged classical studies in Germany. Among his works are *Orthographia Latina* (new ed. by Hales, 2 vols., 1768) and *Notitia Orbis Antiqui* (new ed. by Schwarz, 2 vols., 1773). Consult Sandys, *A History of Classical Scholarship*, vol. ii (Cambridge, 1908).

CELLE, tsél'lē. A town in the Prussian Province of Hanover, situated on the left bank of the navigable Aller, 23 miles northeast of Hanover (Map: Prussia, D 2). It consists of the old town and of a number of suburbs annexed to it during the second half of the nineteenth century. Among the notable buildings are the castle, formerly (1369-1705) the residence of the dukes of Brunswick-Lüneburg; a

number of old churches with monuments of royal personages; the Rathaus, dating from the sixteenth century; and a museum with a complete collection of old army uniforms. A Catholic church contains the vault of the dukes of Brunswick-Lüneburg. The chief products of the town are woolen yarn, printer's ink, soap, tobacco, honey, and wax. It has a considerable trade in lumber and salt. Celle is the seat of the supreme court of the province, and has a forestry school, a gymnasium, a library of over 50,000 volumes, including a number of manuscripts. Pop., 1890, 18,901; 1900, 19,872; 1910, 23,300.

CELLIER, ALFRED (1844-91). An English musician, born at Hackney. He was appointed organist of All Saints', Blackheath, in 1862, and of St. Albans, London, in 1868. From 1877 to 1879 he was the conductor of the Opera Comique, London. His works include some popular songs and part songs, compositions for piano-forte and orchestra, and several operettas and operas, including *The Tower of London* (1875), *The Sultan of Mocha* (1876), *The Spectre Knight* (1876), *In the Sulk* (1880), and *The Mountebanks* (with book by W. S. Gilbert; presented in 1892). He also set to music (1881) Longfellow's *Masque of Pandora* and (1883) Gray's *Elegy*.

CELLINI, chēl-lē'nē, BENVENUTO (1500-71). The most eminent Italian goldsmith of the high Renaissance; also one of its most important sculptors. He was born in Florence, Nov. 1, 1500. In compliance with the wishes of his father, Cellini devoted himself to music until his fifteenth year, but his desire to learn designing prevailed, and he became a pupil of the goldsmith Michelangelo Bandinelli, the father of his lifelong rival, and then of Marconi. He studied also after Michelangelo, copying his famous cartoon of the "Bathing Soldiers." After various adventures and further study, in 1523, as the result of a duel, he was forced to leave Florence, and after wandering from town to town finally went to Rome. Local goldsmiths gave him occupation, and he finally secured the patronage of Pope Clement VII. He soon became recognized as the greatest worker in precious metals of his time. From his autobiography we learn that he was also initiated in "the mysteries of the brass foundry, the methods of hammering iron, the secrets of chiseling steel for medals, and casting dies. . . Enameling and niello formed special branches of his craft; nor could architecture be neglected." He was employed to fashion silver vases, to design medals and settings for jewels, to enamel book-bindings, cast portraits in bronze, and decorate sword blades—in fact, to exercise his perfect art on court trappings, palace decorations, and the personal adornment of those who figured in the splendid society that existed in the halcyon days of the Renaissance. Nor did his commissions prevent further artistic studies after Michelangelo, Raphael, and the antique. Cellini was in Rome when it was besieged by the Constable de Bourbon, and, according to his own account, it was he who killed both the constable and the Prince of Orange. After the sack of the city he went to Florence, where he was chiefly engaged in designing medals, to Mantua, and then returned to Rome. There he worked under Michelangelo and was again employed by the Pope, especially in designing coins. The murder of a rival in 1534 compelled him to flee from Rome. But after a brief visit to France he

again returned, only to be thrown, on a false accusation of defalcation, into the castle of St. Angelo, from which he escaped with great peril. Subsequently, in 1540, Francis I invited him to his court, and Cellini stayed in France five years, the recipient of a pension and title from the King. Aided by numerous assistants, he executed many commissions for the King, such as the bronze relief of the "Nymph of Fontainebleau" (now in the Louvre), a fine specimen of his work, and the celebrated saltcellar mentioned below.

Upon his return from France, where he had alienated himself from every one at the court by his quarrels and eccentricities, Cellini went to Florence, and found a friend there in Duke Cosimo de' Medici. The remainder of his life was spent in Florence, in constant rivalry with the sculptor Bandinelli and in various affrays and adventures. In his fifty-eighth year he began to write his autobiography, and during this time he shaved his unsanctimonious head and retired to a monastery. But two years afterward he returned to the reckless life of his youth. He died in Florence, Feb. 25, 1571, and was buried in the church of the Annunziata.

Most of his surviving sculptures were executed during this last Florentine period. The principal of these is the bronze statue of "Perseus with the Head of Medusa" (1445-54), which is still standing in the Loggia dei Lanzi, Florence. Although a marvel of technical excellence and beautiful in conception, the statue lacks in simplicity of modeling and breadth of treatment and is overwrought in detail. In the four niches of its highly decorative base are small figures of gods unexcelled by anything of the kind in Italian art—and a relief of "Perseus rescuing Andromeda," the original of which is now in the Bargello. The account in his *Autobiography* of the casting of this statue is a classic. Other important statues are the colossal bronze bust of Duke Cosimo I (1545-48, Museo Nazionale, Florence); the bronze bust of Bindo Aldoviti (1566, Gardner collection, Boston); the life-size "Crucifixion" intended for his own tomb, with the figure of Christ in white marble and the cross in black (1562), now in the Escorial. Of the many bronze statuettes ascribed to him we mention only the smaller version of the Perseus (Daviiler collection, Paris), and "Ganymede with the Eagle" (Museo Nazionale, Florence).

As a goldsmith Cellini stands unrivaled among the sculptors of the Renaissance. Here his rich decoration and elaborate detail are in place. Unfortunately nearly all of his masterpieces have been melted down. The saltcellar of Francis I (now in the Museum of Vienna) is regarded as his greatest production. It is of embossed gold and enamel, ornamented with figures of Neptune and Cybele in high relief. It was in such examples of decorative work that Cellini excelled. That which required the skill of a perfect craftsman appealed most readily to his imagination. Many beautiful works of the goldsmith's art have been attributed to him with greater or less likelihood, among which are two exquisite cups in the J. P. Morgan and the Altman collections—both now in the Metropolitan Museum of Art, New York. Among his masterpieces, which through stress of time were melted down, was the gold cope button for Clement VII set with precious stones, including the second largest diamond in the world. Cellini



BENVENUTO CELLINI
"PERSEUS"
FROM THE STATUE IN THE LOGGIA DEI LANZI, FLORENCE

was also the first medalist of his day, in such works as "Hercules and the Nemean Lion," in gold repoussé; "Atlas supporting the Sphere," in chased gold; and medals of Clement VII and Francis I. But Cellini's greatest fame is due not to his art but to his well-known *Autobiography*—an invaluable narrative, not only as an account of his own turbulent, brilliant career, but as a vivid picture of the life and civilization of the Renaissance. The *Autobiography* is, moreover, a highly important monument of literature. Cellini lived in a time when the passions of men were uncontrolled, and Cellini himself embodied them all. His acts of hatred, theft, murder, and sensuality are all set forth in writing, and he also portrays in strong phraseology the scenes, political, social, and ecclesiastical, that made up the history of his contemporaries. Besides the *Autobiography* he wrote a valuable treatise on the goldsmith's craft and on sculpture (1568), with wood engraving after his own designs; modern edition by Milanese (Florence, 1857).

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'CELLO. See VIOLONCELLO.

CELL OF PEACUCELLIER, pō's'-lyá'. See LINKAGES.

CELLULAR TISSUE. See CONNECTIVE TISSUE; HISTOLOGY.

CEL/LULI/TIS (Neo-Lat., from Lat. *cellula*, dim. of *cella*, cell). Inflammation of the subcutaneous areolar and connective tissue, presenting successively edema, swelling, hardness, boggy, fluctuation, suppuration, and sometimes sloughing. It is caused by pus germs, which find their way into the tissues through a wound, or septic matter as from snake bite. Cellulitis is peculiarly liable to follow scalp wounds and may complicate operative wounds, or injuries incident to parturition. The pain is severe, and there are generally somewhat grave constitutional symptoms, as fever, severe headache, nausea, prostration, loss of appetite, and general weakness. Salines, iron, and sometimes stimulants are useful, with incisions to relieve tension or let out pus. Disinfection of all small wounds is a valuable preventive. See PHLEGMASIA.

CELLULOID, sēl'ū-loid (Lat. *cellula*, little cell, dim. of *cella*, cell). A substance of modern invention widely used in the arts as a substitute for ivory, leather, and for many other purposes. It consists of a mixture of nitrocellulose in the form of pyroxylin and camphor. A substance derived from pyroxylin and intended to replace India rubber, gutta-percha, was first made in England by Alexander Parkes, of Burry Port, Wales, in 1855, and was given the name *parkesine*. The modern celluloid was invented and patented in America (U. S. Letters Patent No. 88,634) in 1869 by the Brothers Hyatt of Newark, N. J., and works conducted

by them under the name of the Celluloid Manufacturing Company were the first to manufacture the product on a large scale. Celluloid is obtained by mixing gum camphor with pyroxylin (guncotton pulp) in the proportion of about two parts of pyroxylin to one of camphor. There are two methods: the dry method, where the pyroxylin, after being well washed and dried, is ground fine under water, and after the removal of the water is subjected to great pressure. It is then well mixed with 40 to 50 per cent of camphor, while the coloring material is added. The mass is subjected again to very great pressure and heated by steam to about 130° C. The melted camphor dissolves the nitrocellulose, and celluloid is produced, which remains in the press for a while and is then dried. The second, or wet, process is to dissolve the finely admixed pyroxylin and camphor in methyl alcohol or in ether and then add alcohol, after which an antacid such as urea is added. The mass is then worked in a masticating machine until it becomes plastic, when it is worked for an hour between cold rollers, and then between rollers which are slightly heated. The mass is next subjected to hydraulic pressure for 24 hours in a room kept at a temperature of 70° F. It is then cut into sheets of the desired thickness and allowed to dry for 14 days. It is also applied to other materials, such as cotton, linen, or paper. Celluloid varnishes for lacquering on metal are also extensively manufactured. These are solutions of pyroxylin in mixtures of wood naphtha, acetone, and amyl acetate. Any color can be given to celluloid by the use of coloring matter during the process of manufacture. Some of the advantages of celluloid, besides its cheapness and durability, are that it takes a high polish, does not warp or discolor, and is impervious to moisture. As ordinarily manufactured, it is highly inflammable; but various modifications of the original processes of manufacture have been made, largely by the use of mineral fillers or other esters of cellulose in place of the very inflammable nitrate.

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CELLULOSE, sēl'ū-lōs (from Lat. *cellula*, dim. of *cella*, cell). The chief constituent of the cell wall of all vegetable cells. These walls constitute the plant skeleton and also form a protective covering for the sensitive, living protoplasm. The term "cellulose" covers a number of bodies of similar chemical nature, the relative composition of which may be represented by the empirical formula $C_6H_{10}O_5$; their molecular structures are, however, exceedingly complex, probably much more so than that of starch, to which the celluloses are chemically allied. In nature cellulose is normally combined with woody, fatty, or gummy substances. A typical form, from which pure cellulose can be easily isolated by chemical methods, exists in cotton and flax fibres. Certain plants, such as peas and beans, the *Coffea arabica* and the *Cocos nucifera*, store reserve food in their seed walls as a pseudocellulose, which in this form undergoes hydrolysis more readily than other cellu-

loses. With some exceptions in the insect world, true cellulose is not found in animal tissues. Although considerable quantities of it are digested and absorbed by the herbivora, the amount which man assimilates is usually relatively small. No digestive enzyme has been observed in the animal body having a specific action upon cellulose; it is considered probable that for its disintegration a coöperation of the living cell wall of the intestine and bacteria of the alimentary tract are necessary. The chief value of its digestion by the animal organism has been assumed to consist in this: that the true food-stuff of the plant cells is liberated and rendered available.

Cellulose makes up more than one-third of the entire vegetable matter in the world. Its stability is so great that considerable quantities are preserved unaltered through the process of formation of coal, in which its presence may be demonstrated by means of suitable reagents. It is manufactured on a large scale from wood, cotton, linen rags, hemp, flax, and similar materials of vegetable origin. Being insoluble in all ordinary solvents, it may be readily separated from the other constituents, which are soluble in water, alcohol, ether, dilute alkalies, or acids. It is soluble in an ammoniacal solution of cupric oxide (Schweitzer's reagent), from which it separates out in a pure state on addition of acid; the precipitate is washed with alcohol, and the cellulose is thus obtained in the form of a white, amorphous powder.

The action of sulphuric acid on cellulose depends largely on the concentration of the acid. Moderately dilute sulphuric acid transforms it in the cold into "hydrocellulose," a friable substance soluble in water. This fact is applied in a process called "carbonization," by which cotton fibres are removed from cast-off cotton-woolen material, the wool of which is to be rewoven. If cellulose is dissolved in strong sulphuric acid and the solution is diluted with water, a gelatinous mass separates out, known as *amyloid*, which, like starch, is colored blue by a solution of iodine. In the preparation of vegetable parchment unsized paper is immersed for a few seconds in concentrated sulphuric acid, and then immediately washed with water. A film of amyloid forms over the surface, which on pressing and drying gives a tough, durable paper, less permeable by liquids. Another transformation of cellulose, effected by sulphuric acid, may be mentioned here: if digested with strong acid, it is converted into glucose.

When cellulose has been treated with an alkali, as in the *mercerizing* process, and then exposed to the fumes of carbon disulphide, it goes into solution as cellulose xanthate. By further treatment this solution yields *viscose* films and threads, the latter known as "viscose silk." Viscose is used also for sizing, water-proofing, in textile printing, and mixed with metallic dust and coloring matter furnishes an artificial leather. *Viscoid*, which is a hard mass obtained by mixing viscose with various substances, is used for moldings, cornices, etc. *Cellulose acetates* are also obtained by the action of acetic anhydrides on cellulose in the presence of sulphuric acid. These acetates find numerous applications as films and insulating coatings.

With strong nitric acid cellulose forms explosive nitrates known as nitrocelluloses, the composition of which depends on the strength of the acid employed and the duration of the

reaction. *Collodion* is a solution mainly of the trinitrate and the tetranitrate of cellulose in a mixture of alcohol and ether. Besides its importance in medicine, photography, and in many other ways, collodion forms the basis for a well-known form of artificial silk, that of Chardonnet or Lehner. By dissolving in molten camphor the nitrates employed for collodion, *celluloid* is produced. *Guncotton* is a hexanitrate of cellulose, obtained by the prolonged action of a mixture of concentrated nitric and sulphuric acids. *Blasting gelatin* is guncotton mixed with nitroglycerin; mixed with other substances, guncotton enters into the composition of many smokeless powders.

If distilled in retorts, out of contact with air, cellulose is decomposed with formation of methyl alcohol, formic acid, acetic acid, acetone, and various hydrocarbons. All of these products are obtained also in the destructive distillation of wood. The most important use of cellulose, by far, is in the manufacture of paper. For cheaper grades of paper, the impure cellulose of wood pulp is employed; better grades are manufactured from cotton and linen rags. Consult Bersch, *Cellulose* (Philadelphia, 1904); Cross and Bevan, *Researches on Cellulose* (London, 1895, 1901, 1906, 1912); Cross, Bevan, and Sindall, *Woodpulp and its Uses* (London, 1911); Worden, *Nitrocellulose Industry* (London, 1911); Schwalbe, *Die Chemie der Cellulose* (Berlin, 1912).

CELMAN, sêl'mân, MIGUEL JUAREZ. See JUAREZ CELMAN, MIGUEL.

CELSIUS, sêl'si-ûs or sêl'shî-ûs, ANDERS (1701-44). A Swedish astronomer, born at Upsala. From 1730 to 1744 he was professor of astronomy in Upsala University. He undertook a journey to prominent observatories of Europe in 1732 and in 1740 built the observatory at Upsala and was appointed its director. In 1733 he published a collection of 316 observations, most of which he had made himself, of the Aurora Borealis. In 1737 he took part in the French expedition sent to measure one degree of meridian in the polar regions. He was one of the first to call attention to the subsidence of the sea level off the northern coast of Sweden and urged the introduction of the Gregorian calendar to supersede the Julian. In his monograph *On the Measurement of Heat* (1742) he presented the first idea of the centigrade, also known as the Celsius, thermometer. He published, among other scientific treatises, *De observationibus pro figura Telluris determinanda in Gallia habitis disquisitio* (Upsala, 1738).

CELSIUS, OLOF VON (1716-94). A Swedish historian. He was born in Upsala, where he became professor of history in 1747. He was appointed Bishop of Lund in 1777. In 1742 he founded the first literary journal in Sweden. His works on Gustavus I and Eric XIV are characterized by careful investigation and strict truthfulness. He died while engaged upon his celebrated work, *Svea rikes kyrkohistoria*, which is the first attempt at a compilation of Swedish church history. Two of his best-known histories are *Konung Gustaf I:s historia* (1746-53) and *Konung Erick XIV:s historia* (1774).

CELSUS (Gk. Κέλσος, Kêlsos). A Greek philosopher of the second century, the earliest literary opponent of Christianity. He wrote, in 177 or 178, an attack on Christianity, called *Λόγος Ἀληθής*, or *A True Discourse*. This work

has been lost, but by means of Origen's reply, the *Contra Celsum*, it has been ingeniously reconstructed by Keim (*Celsus wahres Wort wiederhergestellt*, 1873). See ORIGEN.

CELSUS. One of the adventurers, fancifully styled by Trebellius Pollio the "Thirty Tyrants," who, between 260 and 267 A.D., rose to usurp the Imperial throne of Rome. A military tribune, resident in Africa, he was proclaimed Emperor by Vibius Passienus, proconsul of the province, and others; but on the seventh day of his ill-starred reign he was murdered in Sicca.

CELSUS, AULUS CORNELIUS. A Latin physician and writer, who flourished probably in the reign of Tiberius. He was called the Roman Hippocrates (q.v.), because he generally followed the great "father of medicine," and introduced the Hippocratic system among the Romans. Celsus wrote not only on medicine, but also on rhetoric, history, philosophy, the art of war, and agriculture. His style is succinct and clear, but full of Græcisms. Only part of his encyclopædic work survives, the *De Medicina*, which is divided into eight books. The portions relating to surgery are exceedingly interesting and valuable, because Celsus has there given an account of the opinions and observations of the Alexandrian school of medicine. The standard edition is that of Daremberg (Leipzig, 1859). It has been translated into English by J. Grieve (3d ed., Edinburgh, 1837).

CELT. An implement used among the primitive peoples of every part of the world. The term is from the Welsh *celt*, which signifies a flint, or flintstone—a typical form of the implement. In developed form it is a chisel or grooveless axe of any hard stone, used either with or without a haft, in the former case hafted either in line with or transverse to its length and edge. In its nascent form it is an elongated pebble or other stone of convenient size, used in the hand with centripetal (i.e., inward and downward) strokes. Next to the hammerstone it is the most primitive implement used by man. For illustration, see *ARCHÆOLOGY, AMERICAN*.

CELTIÆRI (Lat. nom. pl., from *Celtus*, Celt + *Iberus*, Iberian, Gk. *Κελτίβηρες*, *Keltibêres*). A powerful people of ancient Spain, supposed to have sprung from a blending of the Iberians or Spanish aborigines with Celtic invaders from Gaul. They inhabited a large inland district, corresponding to the southwest half of Aragon and the northern and eastern parts of Castile, but the name "Celtiberia" had often a wider signification, including the country as far south as the sources of the Guadalquivir. The Celtiberi were divided into four tribes, and were unquestionably one of the bravest and noblest peoples in the peninsula. Their cavalry and infantry were equally excellent. They were finally conquered by the destruction of Numantia, one of their chief towns, by Scipio Africanus Minor in 133 B.C. They later joined Sertorius, but after his death became quite Romanized in customs, language, and dress.

CELTIC, *sɛl'tik*; or **KELTIC**, *kɛl'tik*, **CHURCH** (Lat. *Celticus*, from *Celtæ*, Gk. *Κέλται*, *Keltai*, or *Κελτοί*, *Keltoi*; originally meaning 'high' and probably connected with Lith. *keltas*, high, *kálmās*, hill, Lat. *celsus*, high, Gk. *κολωνός*, *kolónos*, hill, less plausibly connected with OIr. *Goidel*, Gael. *Gaidheal*, Gael, Gael). The earliest Christian church in Great Britain and Ireland. It is not definitely known

when Christianity was there introduced. Roman tradition puts it in the second century as the result of a request from King Lucius of Eleutherius, Bishop of Rome from 177 to 193; others argue for the same period, only they connect it with the fierce persecution at Lyons, which drove Christians across the English Channel. These fugitives carried with them the Eastern form of Christianity which the Lyons church had. In the third century Christianity existed in Britain; and in the fourth, bishops from that country signed conciliar rolls. In the fifth century the British Province of Britain was essentially Christian. In the sixth century the invading Saxons drove the Celts into the mountains of Wales, and there four bishoprics existed. Augustine was sent to England by Gregory I in 596, and so the Roman form of Christianity, which in some details differed from the Celtic form, especially as to the date of observing Easter, which the Celts in common with the Eastern church observed on the 14th of Nisan, on whatever day of the week it came, first found lodgment on British soil. In 603 a conference was held by Augustine with some Celtic bishops, but his haughty bearing alienated them. Gradually, however, the Roman form encroached upon the Celtic, and in 777 the last station in South Wales had conformed to Rome. Still the Celtic church was not extinct farther north, but it was declining; and in 1172 it was reformed upon the model of Rome.

Christianity existed in Ireland before the landing of St. Patrick on its shores (c.433), but he was the means of winning the greater part of the island to the Christian faith. The Scottish church was strengthened by Irish monks, who, coming with St. Columba about 563, carried on missionary operations from Iona as a centre, and especially in Northumbria. In 664 the Celtic church in Northumbria conformed to the Roman model, and so its separate history ended, as was the case in Scotland in 1153. In Ireland, the merging of the Celtic into the Roman rite was completed in the same year, and henceforth England, Scotland, and Ireland were Christian without variant rites and ceremonies. See *CULDEES*.

CELTIC LANGUAGES. A group of languages, both ancient and modern, belonging to the Indo-European family, and now comprising Welsh, Breton (Armoric), Irish, Scottish, Gaelic, and Manx. The connection of the Celtic languages with the Indo-European family has been recognized since the publications of Pictet (1837) and Bopp (1838), but the scientific study of them dates principally from Johann Caspar Zeuss, whose *Grammatica Celtica* (1853) laid the foundations of modern Celtic philology. His work has been continued by a series of distinguished scholars both in the British Isles and on the Continent, and rapid progress has been made in all departments of the subject. But in spite of the large number of contributions to this field of research made in recent years, Celtic studies may yet be called new, and it will be some time before these languages are as fully understood or the literatures as thoroughly analyzed as those, e.g., of the Germanic and Romance peoples. The main characteristic of the Celtic group, as distinguished from the other groups of the Indo-European family, is that, before it was separated into dialects, the letter *p*, which was preserved everywhere else, had

disappeared from it without leaving any trace whatever. Thus, a Latin, Greek, or Sanskrit word containing an initial or medial *p* will appear in that family without that consonant (e.g., Latin *porcus*, Old Irish *orc*; Latin *plenus*, Breton *leñ*). With regard to the other members of the Indo-European family, the Celtic group stands linguistically, as it does geographically, in closest relation with the Italic and Germanic. Certain common characteristics of the Celtic and Italic (e.g., the formation of the passive and deponent in *r*, as well as of the *b*-future and other tense stems) have led to the assumption of a common Italo-Celtic language. The Celtic languages themselves fall into two main divisions, the Continental and the Insular. Of the Continental Celtic, or Gaulish, we shall know very little beyond what is now known, because no literary monuments of them have been preserved. While, as late as the second century of the Christian era, Gaulish was still the universal language of ancient Gaul, it was so rapidly driven out by Latin that by the fourth century no more vestiges of it were left. The Armorican peninsula, however, was won back to the Celtic domain by invasions of Brythonic tribes from the British Isles. Inasmuch as the Druidical tradition was purely oral, the only remains of Gaulish that we possess consist of inscriptions and coins, which yield little besides proper names. Additional material of the same sort is found in the Greek and Latin historians, but at times so corrupted by the forms of these languages that it is difficult to determine the original Gaulish word. The Insular Celtic consists of two groups of languages—the Gaelic, or Goidelic (comprising Irish, Scottish Gaelic, and Manx), and the British, or Brythonic (comprising Welsh, Cornish, and Breton). The criterion according to which this classification is made is that an Indo-European *q* (preserved in Sanskrit and Slavic as *k*, in Greek as *π* or *τ*, in Latin *qu*, Gothic *hw*, etc.) appears in the Goidelic group as *k* (written *c*) and in the Brythonic group as *p*. Thus, to the Latin *quinque* corresponds in Old Irish *cóic*, but in Welsh *pump*, in Cornish *pypm*, and in Breton *pemp*. Furthermore, an Indo-European initial *s* persists in the Goidelic group, but becomes *h* in the Brythonic. Thus, Latin *serus*, primitive Celtic *sē-ro-*, becomes *sir* in Old Irish, but *hŷr* in Welsh, Cornish, and Breton. The Gaulish, or Continental Celtic, approaches the Brythonic in changing the *qu* to *p*, but at the same time it preserves the initial *s*. Hence it cannot be classified with either group. Pictish has sometimes been classed with the Celtic languages, but most scholars incline to regard it as not Indo-European. Of the six Insular Celtic languages, five are still living. Cornish died out towards the end of the eighteenth century. Welsh and Breton are each spoken to-day by more than a million of people; Irish by more than half a million; and Scottish Gaelic by somewhat fewer. These languages, however, do not constitute the sole vernacular of the people, most of whom speak also either English or French, according to their nationality. Manx seems likely to die out in the near future, unless it is rescued by the earnest agitation now going on in all the Celtic countries for the preservation of their national tongues. See NEO-CELTIC MOVEMENT.

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J. Longmuir and D. Donaldson (5 vols., Paisley, 1879-87); W. Meyer, *Flexionslehre der ältesten schottischen Urkunden, 1385-1440* (Halle, 1907); Warrack, *A Scots Dialect Dictionary* (London, 1911), which contains a dialect map. WELSH: Rowland, *Grammar of the Welsh Language* (4th ed., Wrexham, 1876); Anwyl, *Welsh Accidence and Welsh Syntax* (London, 1897-1900); Strachan, *Introduction to Early Welsh* (Manchester, 1909); J. M. Jones, *Welsh Grammar* (Oxford, 1913); D. S. Evans, *Dictionary of the Welsh Language* (Carmarthen, 1887-1906), which is as yet incomplete, having only reached the letter E. Consult the additions and corrections of M. Loth in the *Arch. f. celt. Lex.*, vol. i. CORNISH: Jenner, *Cornish Language* (London, 1873-74); *Handbook of the Cornish Language* (London, 1904); Jago, *Ancient Language of Cornwall* (Truro, 1882); R. Williams, *Lexicon Cornu-Britannicum* (Llandoverly, 1865); Stokes, *Cornish Glossary* (London, 1868-69); Loth, *Remarques et corrections au Lexicon de Williams* (Paris, 1902). BRETON: Besides the old grammars of Rostrenen (Rennes, 1738), Le Gonidec (Paris, 1807), Guillaume (Vannes, 1836), Hingant (Tréguier, 1868), there is the *Petite grammaire bretonne* of Ernault (Saint-Brieuc, 1897) and the *Grammaire bretonne du dialecte de Tréguier* of Le Clerc (Saint-Brieuc, 1908). The *Glossaire du parler de Plechâtel* of Dottin and Langouët (Rennes, 1901) and the *Nouveau Dictionnaire français et breton du dialecte de Léon* by Froude (Brest, 1886) are useful. The *Annales de Bretagne* is a valuable review. See GAELIC; IRISH; MANX; WELSH.

CELTIC LITERATURE. See BRETON LITERATURE; CELTIC LANGUAGES; CORNISH LANGUAGE AND LITERATURE; IRISH (GAELIC) LITERATURE; MANX LITERATURE; SCOTTISH (GAELIC) LITERATURE; WELSH LANGUAGE AND LITERATURE; and the bibliography appended to each of these articles.

CELTIC MUSIC. Welsh and Irish music are inseparably connected, for although each country developed its music in accordance with its own traditions and local forms, the bard was the dominant influence which shaped its general character alike in both Wales and Ireland. Poetry was universally identified with music, and musical instruments were used independently only to furnish dance or march music. In the course of time these conditions were changed, but it was not until the decline of the bards that instrumental soloists became a factor in the development of Celtic music. From the earliest historical times, when in the eleventh century a Welsh chieftain summoned Welsh and Irish bards to a great music conference, down to the seventeenth century, when distinctive Celtic music ceased to be written, the musical histories of Ireland and of Wales follow much the same general plan; and, to a certain extent, early Scotch music (q.v.) may be associated with them.

Welsh music was founded by, and for centuries identified with, Druidism. Its influence is apparent even in the modified form of those old songs which still exist. The cadences are savage, weird, yet sad, and far superior artistically to their Irish parallels. The direct reason for this superiority is the fact that the Welsh harp had a perfect diatonic scale, while in Ireland the early scale had but five tones. This diatonic scale made possible the full cadences

and great range of melody which is noteworthy in the early pastoral music of Wales, and which distinguished it from both the Scotch, with its abrupt changes from major to minor, and the less complete Irish. Traditionally Celtic musical instruments were introduced into Britain by the Phœnicians, but there is no historic basis for such a belief. The principal Welsh musical instruments were the *telyn*, or harp; the *crwth*, or sort of a violin; the *piŷgorn*, or hornpipe; the *piŷ-braich*, or bagpipe; the *tadwrdd*, a drum; and the *cornbuelin*, or bugle horn.

Irish Music.—The exact number and position of the tones in the original Irish scale have been long a subject of discussion. All that we can be sure of is that at first only five notes were used, and that later a sixth and a seventh were added. The melodies were very similar to the Scotch, with the important exception that the Irish avoided the abrupt and violent modulations so much used by the former. Dance music, of which there is a great variety, was mostly written in six-eight time. The seventeenth century marked the appearance of foreign musicians in Ireland and the rapid decline and final disappearance of a national music. The early Irish musical instruments were the harp; the bagpipe, distinguished from the Scotch pipe by being blown upon by bellows, instead of from the lips; the *ben-baubbhill*, a horn of a wild ox or buffalo; the *buinne*, a metal trumpet; the *corn*, a long, curved tube; the *stoc* and the *sturgan*, small trumpets; the *musical branch*, an instrument adorned with single bells; and the *tympan*, a stringed instrument played with a bow. Of these, by far the most important was the harp, with its large number of strings and its scale of fixed semitones. In the latest period of Irish music (towards the end of the eighteenth century) there was great uniformity in the compass, the scale, and the method of playing the harp. The ordinary compass was from C below the bass staff to D above the treble staff; and the scale was generally that of G, though sometimes C was used. Almost certainly, however, this uniformity was of comparatively recent date. Some of the oldest harps are the so-called harp of Brian Boru, preserved at Trinity College, Dublin, and having 30 strings; that of Robin Adair at Hollybrooke, with 37 strings; and the Dalloway harp, dating from 1621, and having 52 strings. Among the many famous harpists were: Turlough O'Carolan; Carroll O'Daly, the author of "Eileen Aroon," appropriated by the Scotch as "Robin Adair"; Myles Reilly; and Thomas and William Conallan. Consult: Grove, *Dictionary of Music and Musicians* (London, 1906); D. MacDonald, *Irish Music and Irish Scales* (London, 1910); collections of Irish music by Bunting (1796, 1809, 1840), and by Petrie, in connection with the Society for the Preservation of Irish Music (1855); also collections of Welsh melodies by Parry and by J. Thompson.

CELTIC PEOPLES. A general designation applied to an ensemble of ethnic groups constituting the predominant element in central and western Europe before the rise of the Roman power and the influx of the German tribes, and speaking a language known to us as Celtic. See CELTIC LANGUAGES.

By various early writers the users of Celtic dialects or languages were treated as a distinct ethnic stock or race, known as the Celts or Kelts; but this view is now generally abandoned.

Thus, Keane (1899) observes that the languages are spoken by peoples of so many types that the word "Celt" "has long ceased to have any ethnical significance"; Ripley (1899) says of the term that "a very grave objection to its use pertains"; and Deniker (1900) declares "there is no 'Celtic' type or race."

The Celtic-speaking peoples occupied in antiquity a very wide territory. Radiating from central Europe, which is their earliest ascertainable seat, they spread far into the west, the south, and even the southeast. The date of their settlement in Gaul is doubtful, being variously estimated from 1200 to 700 B.C. They invaded Italy in the fourth century B.C., and in the third century made their way into Greece and as far as Asia Minor. It is inferred from a statement of St. Jerome that a Celtic language continued to be spoken in Galatia until the fourth century of our era. The height of the power of the Celtic peoples was probably about 400 B.C. Before that time they had begun to feel the pressure of the Germanic tribes to the north and east of them, and in the centuries that followed the Roman Empire succeeded in subjugating a large part of the Celtic territory. In the British Isles they continued for centuries to maintain their independence.

Beyond these few general facts our knowledge of the history of the Celtic-speaking peoples is obscure, as is indicated by the diverse views concerning their relations to other Eurasian groups. Their mythology embraced earth gods and various sylvan genii, together with sun or fire deities, and was peculiarly rich in elfin demons and tutelaries, which still pervade the lore of peoples of Celtic ancestry. There were traces also of zoic tutelaries, or beast gods, though this phase of mythologic development appears to have been practically past before the records began; and, as among other branches of the Aryan stock, tradition ran back into the haze of half-deified culture heroes. The social mechanism was dominated by fiducial or ecclesiastical factors, as illustrated by the hierarchic power of the Druids (see DRUID), an order of priests or shamans who performed sylvan rites and practiced magical ceremonies surviving long in the form of ordeal and augury, exorcism and obsession; and the clan system was so deep-rooted as still to survive with vestiges of maternal organization clearly traceable, not only in the avuncular descent of authority in the Highland clans, but in the witchcraft so vividly depicted by Shakespeare. The germ of literature appeared in the Oghams and Oghamic inscriptions of Ireland, i.e., in semiarbitrary characters incised in stone or wood or used in other ways in simple records of men and events. According to Logan (*The Scottish Gael*, 1855) and others, there was a definite Gaelic alphabet of 18 letters, each symbolizing a tree or shrub, and in still earlier times there was a widespread symbolic system embracing the cross, the fylfot or swastika, the trefoil or trivet, and other figures; while in some degree the symbolism ran into colors and weaves, as illustrated by the Highland tartans. In most of the Celtic groups the musical and poetic elements essential to literary and dramatic development were fostered by classes of popular entertainers—bards, pipers, minstrels—who chanted tribal traditions or played and sang patriotic airs, and at a later period sang folk ballads or recited folk tales, and thus prepared the way for that dramatic

and oratorical talent for which the Celtic peoples and their descendants are still distinguished. As summarized by Brinton, "The Irish possessed a sparse literature, going back to the eighth century, and the Welsh to the twelfth, while the oldest Scotch or Breton songs date at the farthest from the fourteenth century" (*Races and Peoples*, 1890, p. 155).

Briefly, then, the Celtic tongues flourished before the beginning of written history and contributed in important measure to the character and vigor of the Aryan tongues, as the vernacular of several of the most distinctive and diverse of the vigorous peoples of central and western Europe, up to a time well within the historical period. They give a stamp to early and even modern literature written in the English. Some of them survive as oral rather than literary languages, but all of them are gradually disappearing.

Consult: Brinton, *Races and Peoples* (New York, 1890); Rhys and Jones, *The Welsh People* (London, 1900); Thébaud, *The Irish Race* (Philadelphia, 1873); Beddoe, *The Races of Britain* (London, 1885); Logan, *The Scottish Gael* (London, 1855); Prichard, *The Eastern Origin of the Celtic Nations*, ed. by Latham (London, 1857); Roemer, *Origins of the English People* (New York, 1887); Keane, *Man, Past and Present* (Cambridge, Eng., 1899); Ripley, *Races of Europe* (New York, 1899); Deniker, *The Races of Man* (London, 1900); Nicholson, *Celtic Researches* (London, 1904); Dottin, *Manual pour servir à l'étude de l'antiquité celtique* (Paris, 1906); Rolleston, *Myths and Legends of the Celtic Race* (London, 1911); Dinan, *Monumenta Historica Celtica* (London, 1911); MacCulloch, *The Religion of the Ancient Celts* (London, 1911); Henderson, *Survivals in Belief Among the Celts* (Glasgow, 1911).

CELTIC VERSION. See BIBLE.

CEL'TIS. See HACKBERRY.

CEMBAL D'AMOUR, sēm'bál' dá'mōōr' (Fr., clavichord of love). A musical instrument belonging to the clavichord family, invented by Gottfried Silbermann early in the eighteenth century. Its form was that of an English spinet. The strings were twice as long as those of the ordinary clavichord; and when touched, the keys struck the central node of the string, both halves of which vibrated simultaneously, thus producing a double volume of sound. There were two bridges instead of one, as in the clavichord, and two sound boards, of unequal forms and dimensions. The cembal d'amour stands between the clavichord and the pianoforte.

CEM'BRA NUT. See PINE.

CEMENT, sē-mēnt' or sēm'ent' (OF. *cement*, *ciment*, Sp., Portug., It., *cimento*, from Lat. *caementum*, rubble, from *cadere*, to cut). Any composition which at one temperature or degree of moisture is plastic and at another temperature and degree of moisture is tenacious, and which, because of these qualities, is employed for uniting metals, stone, glass, wood, or other materials. Solder, gums, putty, mucilage, glue, plaster of Paris, limes, and hydraulic cements are all comprehended in this definition. The most important class of cements, structurally and commercially, is that comprising lime, hydraulic lime, and hydraulic cement. The cements of this class will be described first. In engineering, the term "cement," when not qualified, is generally understood to signify Portland cement.

Lime. Lime, common lime, quicklime, or caustic lime, as it is variously named, is produced by burning limestone, generally in upright kilns, until the carbonic acid has been driven off. The clinker resulting from this burning possesses the property of disintegration or slaking upon being treated with a sufficient quantity of water. The slaking of lime is due to its rapid hydration when in contact with water, and the process is accompanied by a material increase in volume and a considerable evolution of heat. If the quantity of water be just sufficient to cause the hydration of the lime, it is reduced to a dry powder, while if the water be in excess it becomes a paste. The slaked lime thus formed, when mixed to a paste with water and allowed to stand in the air, has the property of hardening and firmly adhering to any surface with which it may be in contact. This hardening of common limes will take place only in air. When lime is very pure and its activity very great, it is known as rich, or fat, lime; if lime contains, either mixed with it or in combination, considerable amounts of inert impurities which lessen the activity of the lime, cause a partial loss of the property of slaking, and diminish its power of hardening, it is known as poor, or meagre, lime. The common method of slaking lime consists in covering it with from two to three times its volume of water, and allowing it to stand until all the lumps are reduced and the mixture is in the condition of a thick paste. Where mechanically hydrated, lump lime is first crushed or ground and to the granulated lime is added a definite quantity of water, sufficient to combine chemically with the lime. One type of hydrator (the Clyde) operates intermittently on separate batches of lime, and another (the Kritzer) operates continuously. The product of the mechanical hydrator is a fine, dry powder which may be shipped in paper bags. For use in construction, lime paste is mixed with from two to three times its volume of sand, when it is called lime mortar. The process of hardening of lime mortar consists in the gradual formation of carbonate of lime through the absorption of carbon dioxide from the air, accompanied by the crystallization of the mass of hydrated lime as it gradually dries out. The hardening process is a slow one at best, and the lime mortar used in the interior of thick masses of masonry, where the air cannot get at it, will take years to become hard. Lime mortar should be used only in masonry exposed to the air.

Hydraulic Lime. Hydraulic lime is obtained by burning limestone containing enough silica and alumina to impart to it the ability to harden under water. In calcination the silica and alumina combine with a portion of the lime to form silicates and aluminates of lime, leaving the remainder of the lime as free lime in an uncombined state. When treated with water, the free lime is slaked. The manufacture of hydraulic lime is practically confined to Europe, and consists, after the quarrying of the rock, of burning, slaking, and bolting the material. The burning is accomplished in kilns, and is a process requiring considerable skill and careful attention. To slake the clinker it is spread in layers from 4 inches to 8 inches deep and sprinkled with water. The object is to slake the free lime without hydrating the silicates and aluminates. After the lime has been reduced to powder by slaking, it is passed

through sieves and packed for shipment. Hydraulic lime is used in the same manner as common lime, being mixed with water and sand to a paste. When in the air hydraulic lime acts like common lime, slowly absorbing carbon dioxide, drying, and hardening. In water the action of hydraulic lime is altogether different from that of common lime, since, owing to the presence of the silicates and aluminates of lime, the hydraulic lime hardens under water, while the common lime does not.

Hydraulic Cements. Hydraulic cements are classified as natural cements, Portland cements, and puzzolanic cements. *Natural cement* is the product obtained by calcining at a low temperature a natural limestone without pulverization or admixture of other materials, and finely grinding the clinker. In Europe these cements are called Roman cements, and they were first manufactured in England in 1796, by James Parker. Natural cements began to be manufactured in France about 1825; in the United States natural-cement rock was discovered while building the Erie Canal in New York, in 1818, and cement manufactured from it was used in the construction of the locks and walls of the canal. France and the United States are the principal producers of natural cement, their respective outputs having been 2,000,000 barrels and 8,800,000 barrels in 1900. In 1910 the production in the United States had decreased to about 1,000,000 barrels, and in 1912 it was even less, but a large proportion of the cement made in France is still of the natural type. The principal centres of natural-cement manufacture in the United States are: Ulster County, N. Y.; the Lehigh valley, Pennsylvania; Mankato, Minn.; Louisville, Ky.; and Utica, Ill. The rock employed is an argillaceous limestone. The process of manufacture consists in mining and quarrying this limestone, breaking it into lumps about the size of one's hand, calcining these lumps with coal in kilns, and finally crushing and grinding the clinker. Natural cements are characterized by a very rapid set and slowness in gaining strength subsequently; they have less initial strength than Portland cement, but in some instances they have attained, after long periods, equal or even greater tensile strength than Portland cements.

Portland cement was made first by Joseph Aspdin, of Leeds, Eng., and was thus named from its resemblance, when set, to the then well-known building limestone quarried at Portland Isle, England. Portland cement is the product obtained by calcining to incipient vitrification an intimate artificial admixture of properly proportioned calcareous and argillaceous raw materials, and finely grinding the clinker. Chemically Portland cement is a combination consisting principally of silicates and aluminates of lime, and the raw materials must necessarily contain silica, alumina, and lime. Within these limitations a great variety of raw materials are capable of being utilized for cement making; in England chalk and clay are used principally; in Germany and France marl and clay and limestone and slate are employed. In the United States limestone and clay or shale, marl and clay, argillaceous limestone and purer limestone, as well as blast-furnace slag with limestone, are used. The first process in the manufacture of Portland cement is the grinding and mixing of the raw materials. This mixture must be uniform and homogeneous, and the respective ingredients properly proportioned, which requires that

they be reduced to a fine powder. The method of reduction practiced depends to some extent, although less now than formerly, upon the character of the raw materials; when readily disintegrable in water, they are usually reduced by one of the wet processes. The wet process proper, formerly extensively used in England, consists in applying an excess of water to the clay and chalk, mixing them in a sort of pug

monly employed artificial puzzolanic cement is made from blast-furnace slag and lime. The hot slag, as it comes from the furnace, is run into cold water and becomes granulated. It is ground to fine powder, and then this powder is ground with lime.

The general range in chemical composition of three principal classes of cement is about as follows:

INGREDIENT		Portland	Natural	Puzzolana
Silica (SiO ₂)	per cent.	19. to 25.	19. to 35.5	19.5 to 30.
Alumina (Al ₂ O ₃)	" "	5. to 9.	4. to 14.5	9. to 15.
Iron oxide (Fe ₂ O ₃ , FeO)	" "	2. to 4.	1.5 to 5.1	0.33 to 3.5
Lime (CaO)	" "	60. to 64.	30. to 60.	45. to 52.
Magnesia (MgO)	" "	0.35 to 4.	1.44 to 25.	0.5 to 4.
Sulphur trioxide (SO ₃)	" "	1. to 1.75	.....	0.18 to 2.7

mill to a thin paste, which is run into settling basins, where the water is decanted off as the solid matter settles until the mixture is dry enough to be cut into blocks or bricks. In the semiwet process only enough water is added to reduce the mixture to a plastic condition in the pug mill.

When hard materials incapable of dissolution by water are employed, they are ground dry in grinding mills, the powder being then either slightly moistened and made into bricks, or, where the rotary kiln is used, stored in powdered form. In the wet and semiwet processes the bricks or blocks are dried and then burned in kilns, of which there are several varieties. (See KILN.) In the dry process, drying preliminary to burning is usually unnecessary. In the United States, where the rotary kiln is used most extensively, the dry powder or the wet paste is run into the kiln without previous brick making or drying. Powdered coal is the kiln fuel at more than 80 per cent of the Portland-cement mills in the United States, and crude petroleum is used at nearly all the others. The powdered coal is blown through a tube into the lower end of the inclined rotating kiln, and the incandescent particles of coal constitute a long flame which heats the raw mixture as it travels slowly through the kiln against the flame. The burning or calcination is continued until incipient vitrification of the raw mixture occurs, the resulting clinker being dark green or black in color. To the clinker is usually added less than 3 per cent by weight of gypsum to serve as a retarder, after which the clinker is ground to an impalpable powder, when, after a period of curing, it is ready for use. (See CRUSHING AND GRINDING MACHINERY.) Extreme fineness of grinding is a prime essential of good Portland cement, many brands of which are ground so fine that from 92 to 96 per cent of the powder will pass through a sieve having 10,000 meshes per square inch, and 75 per cent will pass through a sieve having 40,000 meshes per square inch. Portland cement sets slower than natural cement, but attains its maximum strength more quickly.

Puzzolanic cement, or *puzzolana*, is a term applied to a combination of silica and alumina, which, when mixed with common lime and made into mortar, has the property of hardening under water. Natural puzzolanic cements have been used in Italy from very early times, and are made by grinding certain volcanic tuffs and mixing the powder with slaked lime. These cements are still made and used in Italy and some other parts of Europe. The most com-

monly employed artificial puzzolanic cement is made from blast-furnace slag and lime. The hot slag, as it comes from the furnace, is run into cold water and becomes granulated. It is ground to fine powder, and then this powder is ground with lime.

Other Cements. In addition to the three principal classes of hydraulic cements just described, there are several other classes of minor importance. *Mixed, or blended, cements* include a considerable number of cements which are formed of admixtures of different grades of other cement; of the overburned or underburned portions of the clinker, or of foreign material added to the cement. *Grappier cements* are made by grinding to powder the grappiers left from the slaking and bolting of hydraulic lime. Mixed cements and grappier cements are principally European products. *Sand cement* is the name given to the material formed by grinding together Portland cement and sand to an extremely fine powder and a very intimate mixture. *Surki*, a cement much used in India, is made of one part slaked lime and one-half to one part of finely ground brick dust.

When hydraulic cement powder is mixed with water to a plastic condition and allowed to stand, it gradually combines into a solid mass, and this process of combination is known as the *setting* of the cement. Cements of different characters differ very widely in their rate and manner of setting; some occupy but a few minutes in the operation, while others require several hours; some begin setting immediately, and take considerable time to complete the set, while others stand for a considerable time with no apparent action, and then set very quickly. After the completion of the setting of the cement, the mixture continues to increase in cohesive strength for a considerable period of time, and this subsequent development of strength is called the *hardening* of the cement. The properties of setting and hardening of cement by which a plastic paste is transformed into a hard stone are those upon which the value of cement as a structural material depends. Setting and hardening proceed under water as effectively as in air.

Testing. Previous to its use in structural work, cement is usually tested. The usual tests made are for specific gravity, fineness, rapidity of setting, tensile strength, and soundness. Other tests sometimes made are for chemical composition, compressive and transverse strength, adhesive strength, resistance to abrasion, and permeability to water. The test for fineness consists in determining the proportion of the cement powder which will pass standard sieves. The sieves commonly employed have 2500, 10,000, and 40,000 meshes per square inch. The standard test for rate of setting consists in making cakes of neat

cement about 2 or 3 inches in diameter and $\frac{1}{2}$ inch thick to a stiff paste with water, observing the time when they will bear a needle $\frac{1}{16}$ inch in diameter, sustaining a weight of $\frac{1}{4}$ of a pound, and noting this as the beginning of setting (initial set); then continuing the observations with a needle $\frac{1}{8}$ inch in diameter, carrying a weight of 1 pound until the material is sufficiently firm to bear this, when it may be said to have attained its final set.

Tests for tensile strength are made by breaking test pieces, briquettes, whose smallest section is 1 inch square, in special tensile testing machines. The cement paste, or mortar, is made into briquettes in small molds and is allowed to remain in the molds until set; the briquettes are then removed and kept in a moist atmosphere for 24 hours and then immersed in water, where they remain until tested. Tests are usually made when the briquettes are 7 and 28 days old, and they consist in pulling the briquette in two and noting the pounds of pull required. The test for soundness consists in placing in air and in water cakes similar to those used in the test for setting, and noting, after a few days, whether checks or cracks have developed, which indicate a tendency to disintegration. This is called the normal test for soundness; accelerated tests for soundness are sometimes made, and consist in immersing the cement cake in either hot or boiling water, or heating it in a hot kiln or in flame, and observing whether cracks develop. Considerable doubt exists as to the value of accelerated tests. Chemical analyses of a cement are of value chiefly to determine uniformity in composition and as a check when the other tests indicate a doubtful cement.

The minimum tensile strengths required by specifications in the United States, based upon the recommendations of the American Society for Testing Materials, are the following values per square inch:

AGE OF BRIQUETTE	24 hours	7 days	28 days
Natural cement (neat)	75 lbs.	150 lbs.	250 lbs.
Portland " "	175 lbs.	500 lbs.	600 lbs.

United States Government Standard Specification. A standard specification agreed upon by United States government engineers, representative consumers and manufacturers of cement, and special committees of several engineering societies, was officially adopted as the United States Government Specification for Portland Cement by executive order, signed by President William H. Taft, April 30, 1912.

The important requirements of this specification are as follows:

Definition.—The cement shall be the product obtained by finely pulverizing clinker produced by calcining to incipient fusion, an intimate mixture of properly proportioned argillaceous and calcareous substances, with only such additions subsequent to calcining as may be necessary to control certain properties. Such additions shall not exceed 3 per cent by weight of the calcined product.

Composition.—In the finished cement the following limits shall not be exceeded:

	Per cent
Loss on ignition for 15 minutes	4
Insoluble residue	1
Sulphuric anhydride (SO ₃)	1.75
Magnesia (MgO)	4

Specific Gravity.—The specific gravity of the cement shall be not less than 3.10. Should the cement as received fall below this requirement, a second test may be made upon a sample heated for 30 minutes at a very dull red heat.

Fineness.—Ninety-two per cent of the cement, by weight, shall pass through the No. 100 sieve, and 75 per cent shall pass through the No. 200 sieve.

Soundness.—Pats of neat cement shall remain firm and hard and show no sign of distortion, checking, cracking, or disintegrating, after standing in air or in water for 28 days, and also after exposure to steam for 5 hours.

Time of Setting.—The cement shall not acquire its initial set in less than 45 minutes and must have acquired its final set within 10 hours.

Tensile Strength.—Briquettes made of neat cement, after being kept in moist air for 24 hours and the rest of the time in water, shall develop tensile strength per square inch as follows:

	Pounds
After 7 days	500
After 28 days	600

Briquettes made up of 1 part of cement and 3 parts standard Ottawa sand, by weight, shall develop tensile strength per square inch as follows:

	Pounds
After 7 days	200
After 28 days	275

The average of the tensile strengths developed at each age by the briquettes in any set made from one sample is to be considered the strength of the sample at that age, excluding any results that are manifestly faulty. The average strength of the sand-mortar briquettes at 28 days shall show an increase over the average strength at 7 days.

Brand.—Bids for furnishing cement or for doing work in which cement is to be used shall

state the brand of cement proposed to be furnished and the mill at which it is made. The right is reserved to reject any cement which has not established itself as a high-grade Portland cement and has not been made by the same mill for two years and given satisfaction in use for at least one year under climatic and other conditions at least equal in severity to those of the work proposed.

Packages.—The cement shall be delivered in sacks, barrels, or other suitable packages (to be specified by the engineer), and shall be dry and free from lumps. Each package shall be plainly labeled with the name of the brand and of the manufacturer. A sack of cement shall contain 94 pounds net. A barrel shall contain 376 pounds net. Any package that is short weight or broken or that contains damaged cement may be rejected, or accepted as a fractional package, at the option of the engineer.

Inspection.—The cement shall be tested in accordance with the standard methods prescribed in connection with the specification. In general the cement will be inspected and tested after delivery, but partial or complete inspection at the mill may be called for in the specifications

or contract. Tests may be made to determine the chemical composition, specific gravity, fineness, soundness, time of setting, and tensile strength, and a cement may be rejected in case it fails to meet any of the specified requirements.

Statistics. For use in structural work, cements are usually mixed with sand, to form mortar, or with sand and gravel or broken stone, to form concrete. The chief hydraulic-cement-producing countries of the world are the United States, Germany, England, and France, although it is manufactured to a greater or less extent by nearly all civilized countries. In 1900 the United States manufactured about 8,400,000 barrels of natural cement, 8,500,000 barrels of Portland cement, and 450,000 barrels of puzzolanic cement, valued at about \$17,000,000. In 1912 the quantities manufactured were approximately 820,000 barrels of natural cement, 82,440,000 barrels of Portland cement, and 92,000 barrels of puzzolanic cement, having a total value of \$67,500,000. Germany produces over 30,000,000 barrels of cement yearly, and England about 17,000,000 barrels. France makes annually about 8,000,000 barrels of cement. The principal uses of hydraulic cement are described in the articles on MORTAR and CONCRETE.

Compounds. Besides hydraulic cements, there are many cementing compounds used for various purposes and derived from animal, vegetable, and mineral substances. Animal cements have gelatin and albumin as their basis, while the binding materials of vegetable cements are gums, resins, and wax. Some of these different cements are the following: A cement used for uniting slabs of marble, alabaster, and for many similar purposes consists of plaster of Paris mixed with water to the consistency of thick cream and then applied. The plaster of Paris may be mixed with thin glue, with diluted white of egg, or a solution of gum, instead of with water, and is strengthened thereby. A cement for pipe joints is made of iron borings mixed with sal ammoniac and sulphur. This compound is mixed with enough water to moisten it and then rammed tightly into the joint. The proportions recommended are 1 pound of borings, 2 ounces of sal ammoniac, and 1 ounce of sulphur. For mending earthenware and china, etc., a variety of cements are recommended. For ornamental glass or china which is not subjected to heat or rough usage, Canada balsam that has evaporated until rather hard is a very useful cement; from its transparency it makes an almost invisible joint. The surfaces should be slightly warmed and the balsam brushed over them, after which they should be kept pressed together for a short time. Thick copal or mastic varnish may be used in the same manner. Gum shellac, dissolved in alcohol in sufficient quantity to form a treacly liquid, forms a stronger cement than the above, but its color is objectionable for some purposes. The shellac may be dissolved in naphtha, but the cement thus produced is not equal to that in alcohol. The liquid glue sold in the shops is usually prepared in this manner; another kind is made of a mixture of the solutions of shellac and India rubber. A cement which is sold in sticks consists of shellac or gum mastic fused and molded into a convenient form. It is applied by heating the surfaces to be joined just sufficiently to fuse the shellac and then smearing them thinly with it and pressing them together.

If shellac is heated much above its fusing point it becomes carbonized and rotten, and therefore great care must be used in fusing any composition of which it is an ingredient. *Marine glue*, a mixture of shellac and India rubber, is an excellent cement and, when applied with the precautions just alluded to, is so strong that glass or china cemented with it, and then allowed to fall or otherwise broken again, will give way in any part rather than that cemented. Ordinary glue, so much used by joiners and cabinetmakers, is common or impure gelatin (q.v.), obtained by boiling animal substances, as skins, hoofs, etc., in water. As glue dissolves in water, it is an efficient cement only in dry places. A cement which can be used for many purposes is made as follows: Curdle skim milk with rennet or vinegar, press out the whey, and dry the curd at a very gentle heat, but as quickly as possible. When it has become quite dry, grind it in a coffee or pepper mill and next triturate it in a mortar until reduced to a very fine powder. Mix this powder with one-tenth of its weight of new, dry quicklime, also in very fine powder, and to every ounce of the mixture add five or six grains of powdered camphor; triturate the whole well together and keep it in small, wide-mouthed vials, well corked. When required for use, make it into a paste with a little water and apply it immediately. *Cheese cement* is similar in composition and uses. Take two parts of grated cheese and one of quicklime, in fine powder; beat these together with white of egg to form a paste, and use immediately. *Cutler's cement*, used for fixing knives and forks in handles, is made of equal weights of rosin and brick dust melted together; or, for a superior quality, four parts of rosin, one of beeswax, and one of brick dust. *Mahogany cement*, used for stopping cracks and holes in mahogany, may be prepared by melting four parts of beeswax with one of Indian red, and as much yellow ochre as is found requisite to give the color. If shellac be substituted for the beeswax, and less red used, a much better cement is made. *Mucilage* is a name applied to a great variety of sticky or gummy preparations used for fastening paper and other light materials together. It is sometimes a thickened aqueous solution of gum, and sometimes a preparation of dextrin, glue, or other adhesive materials generally containing some preservative substance or compound, as creosote or salicylic acid.

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CEMENTATION. In geology, the process by which loose materials, such as sands, gravels, and fossil casts, are consolidated into firm rocks. Cementation is caused by the deposition of mineral matter from solutions which have penetrated the loose materials. By this process sands and gravels become quartzites and conglomerates, while the shells of fossils, if calcareous, yield limestones. The most common cementing substances are quartz, calcite, and iron ores. See SANDSTONE; LIMESTONE; CONGLOMERATE.

CEMENTATION PROCESS, IN STEEL MAKING. See IRON AND STEEL, METALLURGY OF. **CEMENTITE**. See CARBIDES.

CEMETERY (OF. *cemetiere*, Lat. *cœmili-rium*, Gk. *κοιμητήριον*, *koimēthērion*, sleeping place, later graveyard, from *κομᾶν*, *koiman*, to put to sleep, from *κεῖσθαι*, *keisthai*, to lie down). A graveyard or other place of deposit for the dead. The term is used with particular reference to those extensive ornamental burial grounds which have been established in the United States and other countries, as the practice of burying within and around churches has gradually been abandoned. (See BURIAL.) There was at first a natural feeling of regret at the prospect of deserting places of deposit for the dead so hallowed by ancient use and associations as the church and the churchyard, but in many instances such places were in reality surrounded by degrading, disgusting, and insanitary conditions. On the other hand, the new places of interment began to develop humanizing and elevating influences, in the way of beautiful trees and flowers, natural scenery, and artistic monuments. The fine burial grounds of the Turks, extending over large tracts and adorned by cypress and other trees, may have suggested the desirability of such cemeteries to Europeans. Around Constantinople the cemeteries are located in vast tracts of woods under whose branches stand thousands of tombstones. It is the custom never to reopen a grave, and a new resting place is given to every one, with the result that the dead now occupy a wider territory than that which is covered by the homes of the living. The Turks believe that until the body is buried the soul is in a state of discomfort, and the funeral therefore takes place as soon as possible after death. No coffin is used. The body is laid in the grave and a few rough boards placed about it and then the earth is shoveled in, care being taken to leave a small opening from the head of the corpse to the surface of the ground. This method, from a sanitary standpoint, is preferable to the custom of using double wood or even metallic coffins, for as little as possible should be done to interfere with the speedy dissolution of the body into its elements.

The famous Père Lachaise, in Paris, is the most celebrated of modern cemeteries, although by no means the largest. It was laid out in 1804 and comprises about 110 acres and about 20,000 monuments erected to the memory of nearly all the great men of France of the nineteenth century. Twice this cemetery and the neighboring heights have been the scene of desperate fighting. In 1814, during the attack on Paris by the allies, it was stormed by a Russian column; and in 1871 the Communists made their last stand among these tombs, where 900 of them were killed, 200 being buried in quicklime in one huge grave and 700 in another. Paris has also the cemeteries of Montparnasse and Montmartre, besides many smaller burial grounds. In 1874 a very large cemetery was laid out 16 miles north of Paris, covering nearly 1300 acres. In France every city and town is required by law to provide a burial ground beyond its barriers, properly laid out and planted, and each interment must take place in a separate grave. This law does not apply to Paris, however. There the dead are buried 40 or 50 at a time in the *fosses communes*, or the cemeteries outside of the city limits, the poor being interred gratuitously, and

a charge being made in all other cases. The *fosse*, when full, is left undisturbed for five years; then all the crosses and other memorials are removed, the level of the ground is raised four or five feet by fresh earth, and interments begin again. For 50 francs a grave can be leased for five years; but when permanent monuments are desired the ground must be purchased in fee. Pit burial is also practiced in Naples and in other cities of continental Europe. In one of the Neapolitan cemeteries a pit is opened each day in which all the burials of the day are made. At night a joint funeral service is held for all and the pit is filled, not to be opened for a year.

In English cities, about 1840, the people began to discuss the dangers to public health arising from the condition of the graveyards surrounding and the vaults within and underneath the great churches. In London these receptacles were literally crammed with coffins, and the surrounding air was polluted to a dangerous degree. Coffins were piled upon each other until they came within a few inches of the surface of the ground, and then the ground was raised from time to time until its level came nearly up to the lower windows of the church. To make room for new burials old bones were thrown out, and this led to systematic robbing of graves for the sake of the coffin plates and the ornaments sometimes buried with the bodies. The result of this action and of discussion was an entire change in the system. Burials within the limits of the cities and villages were prohibited, and as a necessity rural cemeteries were founded.

Of the cemeteries still in use in southern Europe, the catacombs of Sicily are the most remarkable. In one of these, near Palermo, under an old Capuchin monastery, there are four subterranean corridors, in which more than 2000 corpses are ranged in niches in the wall, many of them shrunk into the most grotesque attitudes, or hanging with pendent heads or limbs from their receptacles. As a preparation for its niche, the body is desiccated in an oven, and then dressed as in life and put in its place in the wall. At one end of this cemetery there is an altar, strangely ornamented with a mosaic of human skulls and bones.

Campo santo ('holy field') is the Italian designation for a cemetery or burying ground, but more especially for an inclosed place of interment, surrounded internally by an arcade, and designed to receive the remains of persons of distinction. The most famous *campo santo*, and that from which the others derived the name, is that of Pisa—in the neighborhood of the cathedral and leaning tower, and consecrated to the memory of men who had deserved well of the republic. It was founded by Archbishop Ubaldo, towards the end of the twelfth century. The Archbishop, having been driven out of Palestine by Saladin, brought his 53 vessels, which had been destined for the conquest, laden with the earth of the Holy Land. This he deposited on the spot which was thence called the holy field, and which, as has been said, gave its name as a generic term to the burying grounds of Italy. The architect of the existing building was Giovanni Pisano, under whose superintendence it was completed in 1283. It contains an area of over 400 feet in length and 118 feet in breadth, and is surrounded by a lofty wall, on the inner side of which a wide arcade runs round the whole inclosure, giving to it the character of one magnificent cloister. On the eastern side there is a

large chapel, and two smaller chapels on the northern side. The lofty circular arches of the arcade are filled with the richest Gothic tracery, which belongs, however, to a later date—the latter half of the fifteenth century. The walls are adorned with frescoes which are of great interest and value, both absolutely and with reference to the history of art. The oldest of those which have been preserved adorn one side of the eastern wall; they represent the passion of Christ, his resurrection, and other sacred subjects. These remarkable paintings are supposed to date from before the middle of the fourteenth century, and are ascribed to Buffalmaco. But the most marvelous productions are those of Giotto, of Simone Memmi, and of Andrea and Bernardo Orcagna.

America closely followed England in the sanitary reform of burial places, and many years ago burial within certain limits of cities was prohibited except in special cases, such as the use of private vaults in churchyards. Within the limits of Greater New York, however, in the territory included in the Borough of Queens, and once forming the town of Newtown, it was estimated in 1900 that there were 1800 acres of cemeteries, covering one-tenth part of a district which contains 25,000 living inhabitants and the remains of 1,000,000 dead.

The United States has more beautiful cemeteries than any other country. Conspicuous among these are the great national cemeteries located in a few Northern and many Southern cities, for the burial of soldiers, especially those who were killed in the Civil War. The oldest and one of the most beautiful of the great cemeteries in the United States is Mount Auburn, near Boston, which dates from 1831. Laurel Hill Cemetery, in Philadelphia, was opened in 1836. It is on the Schuylkill River, about 4 miles north of the centre of the city, and is part of a region of great beauty. Greenwood Cemetery, the first and one of the largest burial places for New York and Brooklyn, was opened in 1840 by a company chartered in 1838. The grounds occupy a fine situation of about 500 acres on the east side of New York Bay about 3 miles south of the Brooklyn Borough Hall. From the higher points of the cemetery the eye takes in New York and Brooklyn, the bay, half a dozen cities in New Jersey, the far-off Palisades, the broad lower bay, the Highlands near Sandy Hook, Coney Island, and a grand view of the Atlantic Ocean. Woodlawn Cemetery, also in New York City, is well known. Other notable cemeteries in the United States are Oakwood, overlooking the Hudson at Troy, N. Y., Rural, in Albany, which is the burial place of Chester A. Arthur, and Homewood, in Pittsburgh, Pa., noted for its many fine monuments and mausoleums. Lake View Cemetery, at Cleveland, Ohio, is one of the celebrated places of interment in the interior States, and contains the Garfield Mausoleum. The largest cemetery in the United States is said to be Pine Lawn, on Long Island, which has an area of some 2000 acres.

The site of a cemetery is a matter of extreme importance. It should be situated as far as possible from any populous locality, in order that it may not interfere with the needs of the living, and so may remain undisturbed for the greatest possible length of time. The soil should be light and porous, permitting abundant entrance of water and accompanying air, to expe-

dite decomposition. There should be good, natural underdrainage, but care should be taken that the drainage from cemeteries does not discharge directly into drinking waters. The frequent proximity of cemeteries and reservoir sites is a fact to be deprecated. There should be strict municipal regulation of the depth and distance apart at which graves may be dug.

The ownership of cemeteries is divided among municipalities, churches, and private corporations. In the continental cities municipal ownership of cemeteries is the rule, although there are some private cemeteries, especially in Germany and Holland. In some cities, as Cologne, Naples, Dresden, and Rome, the management of funerals is also controlled by the municipality, the result being to decrease greatly burial expenses. British towns usually have municipal cemeteries, but most of them are old and little used, the newer burial grounds being privately owned. Manchester, Nottingham, and several other of the larger towns have recently taken steps to provide adequate municipal cemeteries.

In the United States the largest and most popular cemeteries are usually owned by private corporations, but many cities and towns own one or more cemeteries. The privately owned cemeteries are often of a mutual character, and in general, efforts to make large profits from cemeteries do not meet with approval.

The older cemeteries were usually laid out on the rectangular plan and when filled became a wilderness of tombstones, monuments, and lot markers, not always relieved even by trees or shrubs and showing no element of design or of unity save as regards the rectangular lots, paths, and drives. The modern cemetery of the rural or park type is often a notable example of landscape art, sometimes with few or no gravestones or lot markers extending above the grassed surface, which latter is not allowed to be broken by mounds above the graves. An office, a chapel, and a superintendent's residence, the latter in or near the cemetery, are commonly provided. Most of the crematories for burning the dead are located in cemeteries, joined with a chapel. Carefully planned and kept cemetery records are essential, especially as regards burial certificates, which have a most important relation to vital statistics. For information about ancient burial places, see *NECROPOLIS*; *GRAVEYARD*. For information concerning burial customs, see *BURIAL*. For an outline of the principles and practice of designing and managing cemeteries, consult Weed, *Modern Park Cemeteries* (Chicago, 1912). For many important papers on cemetery design, management, etc., consult annual proceedings Association American Cemetery Superintendents, a body organized in 1887; also consult *Park and Cemetery*, a monthly journal (Chicago). See *CREMATION*.

CEMETERY LAWS. Laws which have for their objects the selection, adornment, regulation, and protection of suitable burial places for the dead. Cemeteries may be so located as to endanger health by corrupting air or water, and hence their location may be controlled either by the courts or by the Legislature. In the United States cemetery associations are frequently incorporated under State statutes, and are generally exempted from taxation. The object of this exemption is not only to relieve such associations from the burden of taxation, but to secure burial grounds from sale for the non-payment of taxes. From similar reasons in

ome States, a burial lot cannot be seized or old for the debts of its owner, and if he executes a mortgage upon it, the transaction is void as against public policy, provided interments have been made therein. Cemetery lots in which burials have not been made, however, may be bought and sold, subject to the rules of the association controlling them. The desecration of cemeteries, as well as the unlawful interference with those who have vested rights in their use, are severely punishable. Consult *Perley, Mortuary Law* (Boston, 1896).

CENABUM. See **CARNUTES**; **CHARTRES**.

CÉNACLE, sâ'nâ'kl' (Fr., dinner chamber, from Lat. *cenaculum*, dining room, from *cena*, *cesna*, Umb. *cesna*, dinner). A name given to a Parisian literary group of varying constituency that began about 1826 to gather around Charles Nodier (q.v.) and sought to revive in French literature the old monarchical spirit, the spirit of mediæval mystery and spiritual submission. Of the First Cénacle, as it is called, the chief members were Vigny and the brothers Deschamps. These were soon joined by Lamartine, Hugo, and Sainte-Beuve, who describes the group as "royalists by birth, Christians by convention and a vague sentimentality." Their organ was *La Muse Française*. They soon grew iconoclastic towards classicism, and were led by the exigencies of controversy from their monarchical position to a democratic attitude. Lamartine and Hugo had favored the Bourbons. They now turned even from the Orleanists to the Revolution and Napoleon. Thus the Cénacle won the alliance of Musset, Mérimée, and the elder Dumas, and, after the revolution of 1830, of Gautier and Gérard de Nerval. But with that year and the triumph of Hugo's *Hernani*, its reason for existence disappeared, and the spirit of individuality inherent in romanticism soon caused the Cénacle to dissolve in fact and as an influence. Consult the index (*Table*, Paris, 1881) to Sainte-Beuve's *Causeries du lundi*, etc., which refers to admirable studies in the latter work of various members of the Cénacle. See also **ROMANTICISM**; **HUGO**, **VICTOR**.

CÉNA TRIMALCHIONIS, tri-mäl'ki-õ'nis (Trimalchio's Dinner Party). The most important episode in the *Satiræ* of Petronius, a vivid description of a dinner party given by Trimalchio, a former slave, who had become very rich by trade. The lavish feast is described by a certain Encolpius, one of the guests, and the story is of value for the specimens of colloquial Latin, the *sermo plebeius*, preserved in it (most of the guests are ex-slaves and talk accordingly).

CEN'CHERUS. See **BURGEASS**.

CENCI, chên'ché, **BEATRICE** (1577-99). An Italian of the sixteenth century, the heroine of a celebrated tragedy in real life. She was the daughter of Francesco Cenci, a wealthy Roman nobleman, head of a family notorious for its crimes and profligacy. It had long been supposed that Beatrice was the victim of her father's brutal passion, and that this was her provocation for the murder of Francesco, a crime in which she was aided by several other members of the family. With her accomplices, she was executed in 1599. A famous portrait in the Barberini Palace, Rome, supposed to have been painted by Guido Reni, caused her to be known as the "beautiful parricide." One of Shelley's most powerful dramas, *The Cenci*, is founded upon the traditional story of Beatrice. It is now believed, however, owing to the re-

searches of Bertolotti, that Francesco was much less of a monster than was supposed, and that Beatrice, even aside from the question of her share in the murder, was in character far from innocent; it further appears, according to Bertolotti, that she was not beautiful, and that the famous painting is not of Beatrice, nor by Guido Reni. Consult Bertolotti, *Francesco Cenci e la sua famiglia* (Florence, 1879); and for the traditional account, Muratori, *Annali d'Italia* (Milan, 1744-49).

CENCI, THE. A powerful poetic tragedy by Shelley (1819). Though written for the stage, and offered for presentation, the nature of the drama is such as to make its acceptance impossible.

CENDRILLON. An opera by Massenet (q.v.), first produced in Paris, May 24, 1899; in the United States, Nov. 6, 1911 (Chicago).

CENEDA, chá-nâ'dâ. An Italian city. See **VITTORIO**.

CENIS, se-nâ', **MONT**, or **MONTE CENISIO**. A mountain of the Alps, between Savoy and Piedmont, on the frontier between Italy and France, forming part of the watershed between the valleys of the Dora Riparia and the Arc (Map: France S., M 3). The culminating point of the pass over Mont Cenis reaches an elevation of about 6850 feet above sea level. The mountain is composed of schist, limestone, and gypsum, and is covered with a rich vegetation. The road over the pass, constructed in 1803-10, under Napoleon's orders, has a total length of 40 miles, and prior to the construction of the railway tunnel under the Col-de-Fréjus, about 14 miles southwest of Mont Cenis, was one of the most patronized routes across the Alps. The tunnel, constructed in 1857-70, is nearly 8 miles long and varies in altitude from 3775 to 4245 feet. The cost of construction was nearly 75,000,000 francs (\$14,475,000). See **TUNNELS**.

CEN'OMA'NI. The name of a people in ancient Gaul, a branch of the Aulerici, who assisted Vercingetorix (q.v.) against Cæsar. Their chief city was Civitas Cenomanorum, known now as Le Mans. (See **MANS**, **LE**.) According to ancient writers, a part of the Cenomani invaded Italy as early as 400 B.C., drove out the Etruscans from a part of Gallia Transpadana, and settled there. These Cenomani were usually friendly to Rome.

CEN'OMA'NIAN (so called from the ancient Celtic tribe of *Cenomani*). The name given by the French to the lower portion of the Upper Cretaceous period. It corresponds to the Dakota epoch of American geologists.

CEN'OTAPH (Fr. *cenotaphe*, Lat. *cenotaphium*, from Gk. *κενοτάφιον*, *kenotaphion*, empty tomb, from *kenós*, *kenos*, empty + *táphos*, *taphos*, tomb). A monument which does not cover the remains of the deceased, erected originally for those whose bones could not be brought home for interment, as for those who died in foreign parts or had perished at sea. Consult Vergil, *Æneid*, 3, 304; Xenophon, *Anabasis*, 6, 4, 9. In Suetonius, *Claudius*, 1, such a tomb is called *tumulus honorarius*.

CENOZOIC ERA (from Gk. *καινός*, *kainos*, new + *ζωή*, *zōē*, life). One of the main divisions of eras of geological time, preceded by the Mesozoic era and followed by the Recent era. The term is used by some geologists to include the Tertiary and Quaternary periods, while others limit it to the Tertiary alone. For description of the rocks and included life forms

characteristic of Cenozoic time, see TERTIARY SYSTEM; QUATERNARY SYSTEM.

CEN'SER (abbreviation of *encenser*, OF. *encenser*, from ML. *incensare*, to burn incense, from *incensum*, incense, from *incendere*, to burn, from *in*, in + *cendere*, to burn). A vessel for burning perfumes (see INCENSE), also called

"thurible," from *thus*, frankincense. It is swung in the air ceremonially during public worship to activate the burning of the incense and diffuse its perfume. Censers were used from very early times in the Jewish services, and have been always employed in those of the Roman Catholic and Eastern churches; also of recent years in some Episcopal churches. They are usually made of brass or copper; rarely of silver or gold. Little is known of their precise shape before the twelfth century, at which time they were richly decorated, set with jewels, and sometimes made in the form of small churches, as, e.g., those in the cathedrals of Treves and Namur. They were also often shaped like a ball, with two hollow halves. In later specimens the upper half varies very much in form, being often surmounted by a turret. The lower half, resting on a foot, holds the charcoal and the incense, while the upper one is perforated to allow the smoke to escape, and can be moved up and down on three or four chains.



CENSER.

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CEN'SO, *Sp. pron. thán'só*. In Spanish law, an annual payment, in money or in produce, charged upon land for an indeterminate period. The Spanish civil code of 1889 (in force in Cuba, Porto Rico, and the Philippines) recognizes and regulates three classes of *censo*. *Censo enfiteutico* is the ground rent paid by the holder of a perpetual lease. (See EMPHYTEUSIS.) *Censo reservativo* is an annual payment reserved by the conveyor of land and made a perpetual charge upon the land conveyed. *Censo consignativo* is an annual payment which the owner of land, in consideration of a capital sum paid him, has placed as a perpetual charge upon his land. In the first of these cases the recipient of the annual payment is titular owner (*dueño directo*). In the second and third cases he is not owner, but a creditor of the land; his claim runs against every person who takes the land by purchase, devise, or inheritance, and it is a lien upon the land. In all cases the *censo* may be redeemed (i.e., the land may be freed from the annual charge) by payment of the corresponding capital. The right of redemption may, however, be suspended by contract in the case of the purchased rent charge (*censo consignativo*) for 20 years, and in the other cases for 60 years.

CEN'SOR (Lat., from *censere*, to assess, estimate). The name of two Roman officers of

state, first elected in 443 B.C. The office was filled by patricians till 351 B.C., when Gaius Marcius Rutilus, a plebeian, was elected censor. Twelve years later it was enacted that one of the censors must be a plebeian. In 131 B.C. both censors, for the first time, were plebeians. The censors were elected in the *comitia centuriata*, presided over by a consul (see COMITIA). The term at first lasted five years, but from 434 B.C. was limited to eighteen months and reelection was forbidden. The censorship was regarded as the highest dignity in the state, except the dictatorship. It was a sacred and irresponsible magistracy, whose powers were vast and undefined, and whose decisions were received with solemn reverence. The duties of the censors were threefold: (1) the taking of the census, or register of the citizens and of their property; (2) the *regimen morum* (regulation of morals); (3) the administration of the finances of the state. The taking of the census was originally their sole function (hence their name) and was held in the Campus Martius, in a building called *villa publica*. The *regimen morum* was the most dreaded and absolute of their powers. It grew naturally out of the exercise of the previous duty, which compelled them to exclude unworthy persons from the lists of citizens. Gradually the superintendence of the censors extended from the public to the private life of citizens. They could inflict disgrace (*ignominia*) on any one whose conduct did not square with their notions of rectitude or duty. For instance, if a man neglected the cultivation of his fields, or carried on a disreputable trade, or refused to marry, or treated his family either too kindly or too harshly, or was extravagant, or guilty of bribery, cowardice, or the like, he might be degraded by removal from the Senate, exclusion from the tribes or the centuries, or loss of equestrian status. The administration of state finances included the regulation of the *tributum*, or property tax; of the *vectigalia*, such as the tithes paid for the public lands, salt works, mines, customs, etc., which were usually leased out to speculators for five years (see PUBLICANI); the preparation of the state budget, etc. Consult Leuze, *Zur Geschichte der römischen Censur* (Halle, 1912), and the article "Censor" in Smith, *A Dictionary of Greek and Roman Antiquities* (3d ed., London, 1890).

CEN'SORI'NUS. A chronologist and grammarian of the third century A.D., known by a work called *De Die Natali*, in which he treated of man's generations, his natal hour, and the influence that the stars and genii exercise over his fate. Its chief value to us lies in the facts and dates derived from earlier authors whose works are now lost, especially Varro and Suetonius. It has been edited by Hultsch (Leipzig, 1867) and translated by Maude (New York, 1900).

CEN'SORSHIP. In the widest sense, the general supervision and control of public morals and the public welfare, such as was exercised by the Roman censors. The term is now, however, almost exclusively applied to the examination of manuscripts, writings, and literary productions of all kinds as a condition of their publication, with the suppression of part or all, as may seem necessary to the censor or licenser, for the protection of public morals or the integrity of the government. While the censorship of private morals, as such, does not now exist among civilized nations in the arbitrary form

in which it was exercised by the Roman censors, humanity has not yet outgrown the disposition to force the private life of the individual into conformity with the prevailing standards of the community or of the official or ruling class of the state. Ordinarily this censorship is exercised by the legislative authority in the enactment of laws imposing penalties upon individuals who in the conduct of their private lives deviate from the standards so set up, or by police officials or magistrates who are charged with the duty of interpreting and enforcing such laws.

The advance of civilization and the development of the idea of the right to personal liberty may be expected to do away with the grosser forms of censorship still prevailing among civilized peoples. Those forms which are most in evidence at the present day are the censorship of the press and of the drama.

The censorship of the press was intended to prevent the publication and effect of literature supposed or believed to contain matter likely to corrupt morals or be subversive of the government. It came into existence with the invention of the printing press, although in all despotic governments in the history of man writings offensive to the government have been suppressed or destroyed, and in many cases the author punished as well, for the same motives as those which gave rise to the censorship of the press and of the drama. Literary censorship was rigidly maintained by the Roman Catholic church as early as the year 1515, and all books published within its control were and still are subjected to the strictest examination and expurgation or suppression when deemed necessary. (See INDEX; VATICAN.) The censorship of the press in England was strictly enforced as early as 1637 by order of the Star Chamber, which order was established by statute in 1662. It was against this statute that Milton wrote his *Areopagitica*, or "Plea for Unlicensed Printing," and the censorship was abolished in 1693. In France the censorship which had existed since the invention of the art of printing was abolished in 1789, and revived at intervals until 1830, when it was finally abolished. With the growth of constitutional government in the states of modern Europe the censorship of the press has been generally abolished, though it still exists in Russia, Turkey, and other backward states. For a fuller discussion and treatment of the subject, see FREEDOM OF THE PRESS.

Censorship of dramatic productions is based upon the assumed necessity of protecting the public from the influence of immoral plays. This is accomplished in the United States by the law which enables any public immorality to be suppressed as soon as an overt act has been committed, which can be shown to be an offense against public morals. In England, however, a censorship of the stage exists under the provisions of 6 and 7 Vict., c. 68. Formerly, in the seventeenth and eighteenth centuries, the performance of plays was controlled by the Master of Revels and the Lord Chamberlain; and the Statute of 10 Geo. II, c. 28, defined and established the duties and powers of the Lord Chamberlain in this capacity. Under this statute his powers were restricted as to their territorial limits; but by the Statute of 6 and 7 Vict. his jurisdiction is extended (by section 12) to the whole United Kingdom. Chapter 68 of this

statute provides that one copy of every new stage play, every new act, scene, part, prologue, or epilogue of a play, intended to be acted for hire at any theatre in Great Britain should be sent seven days previous to the Lord Chamberlain for his allowance, and he may license or refuse to license its production, and may revoke a license already granted, and forbid the production of the play whenever it appears to him advantageous for the preservation of good morals or decency or to preserve public peace. His authority is exercised upon the recommendation of his reader. He has no authority to license playhouses. This is vested in the County Council, who may delegate it to one of the justices of the peace, who formerly exercised it. See the *Law Magazine and Law Review*, 19, 220.

Something akin to censorship is to be found in the statutory and administrative restrictions on the use of the mails for the circulation of gambling and fraudulent circulars and obscene publications. The protection of the public, therefore, from wrongful publications is, in general, left in Great Britain and the United States to the enforcement of the laws protecting public and individual rights from violation; and so the circumstances under which a publication is made may be such that the publisher may be enjoined by the court from further publication of the same matter, if this be necessary for the protection of violated rights.

Where a territory or country is under martial law, censorship of the press by the military authorities is commonly exercised in all countries, so far as it is considered necessary by the military authorities. See COPYRIGHT; LIBEL; NEWSPAPER; MARTIAL LAW; and consult Dicey, *The Law of the Constitution* (London, 1908), chap. 6.

CEN'SUS (Lat., registration, from *censere*, to assess, to judge). The familiar use of the word "census" is to denote the periodical counting of the people, and this is its primary meaning. As the census of population has been usually accompanied by comprehensive investigations into agriculture, manufactures, etc., the term has come to be employed for any statistical investigation which proceeds by the method of direct interrogation. Used in this broad way the name "census" designates one of the two methods of statistical research, the other being registration. Census and registration are not interchangeable, but one is frequently used as a substitute for the other. A census portrays conditions at a given time, a register the changes which take place. As two successive censuses by comparison show the resultant of these changes, we can, under certain circumstances, by summing up the changes, arrive at the general condition of affairs without a direct enumeration.

Antecedents of the Census.—The origin of the American census in the well-known constitutional provision that representation and direct taxation should be proportional to population, suggests the intimate connection between census operations and government necessities. That similar necessities in early days gave rise to enumerations of the people will be readily understood. We find references to counting the people in our accounts of ancient peoples like the Hebrews and the Romans. China and Japan also have records of very early enumerations. These records seem to have been undertaken for fiscal or military purposes, to establish the ownership of landed property or to determine

military contingents, and involved a count of the people not as the main issue but as an incident. In this they differed from the census operations of to-day.

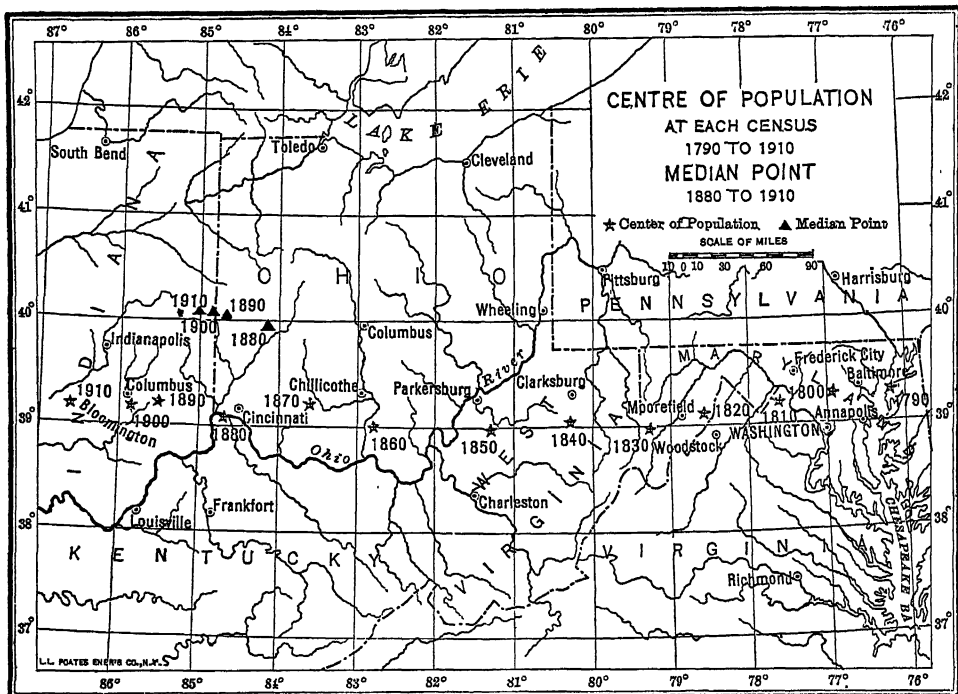
This is likewise true of such records as that of the *Domesday Book* frequently pointed out as illustrations of statistical practice during the Middle Ages. Indeed, a direct enumeration of the whole people having no other object in view than to ascertain their number, first took place with the census of the United States in 1790, and the principal development of the census occurred in the nineteenth century. Before that time there had been, in several European states, efforts directed to ascertaining the number of the people or of particular classes. Perhaps the most comprehensive of these efforts took place in Sweden. In 1686 parish registers were intro-

duced, in which not only births and deaths, but also arrivals and departures were to be noted. By means of these registers the number of the population was ascertained, and beginning with 1749 comprehensive statements for the entire land were published. Such population registers from which, in lieu of an enumeration, the number of the population can be ascertained, exist to-day in many places. It was mainly from such registers that the early notices of the population of Prussia and Austria were gathered. To them should be added the reports made from time to time by the administrative offices of the various districts of the number of persons, especially of those capable of bearing arms, under their jurisdiction. In all this we see the beginnings of the modern census.

Enumeration of Population.—The census has been a matter of slow growth. In its present-day form it involves a record of the salient facts pertaining to every person in the community, these facts being summarized for territorial and other groups. But it was a long time in coming

to this point, and early records are oftentimes very summary.

The most usual form of the census is the census of population, recurring at regular intervals of five or ten years, as the case may be. The inauguration of regular census taking by the United States in 1790 has already been noted. England, Holland, and Norway followed in 1801. In France a census took place in 1801, but after that irregularly until 1831, when the regular series begins. In Prussia a census was taken in 1816, but without any instructions to the local authorities, who were free to use their own discretion in the matter. It was hardly until the middle of the nineteenth century, as we shall see in reviewing the history of census taking in the United States, that methods acquired stability.



Development of Population Census.—The progress of census taking can be seen in an examination of the development of the census of the United States. That of 1790 was a model undertaking, whose results were fully stated in an octavo pamphlet of 56 pages, while the report upon population in the census of 1910 fills four quarto volumes. The census of 1790 recorded only the heads of families, dividing the members of the family into the following classes: free whites, males 16 years and over, males under 16 years, females, other free persons, and slaves. Until 1850 no essential change was made in the form of enumeration, though the classes were enlarged to embrace age, occupation, physical infirmity, and other data. By 1840 the schedule had grown so unwieldy that for each family there were as many as 70 spaces in which entries might be made. In this period there could be no tabulation of statistics in the modern sense of the word. No combinations other than those given in the original schedule could be made, and facts given under

one head, e.g., age, could not be combined with those given under another, e.g., illiteracy. In 1850 a radical change was introduced, and for the first time every inhabitant was recorded by name, the questions being answered for each person specifically, and not for the family group of which he was a part. This change in the manner of asking the questions necessitated the establishment of a central office in Washington in which all the schedules were gathered and the tabulations made. The collection of the figures was in the hands of the United States marshals until 1880, but since that date has been in charge of the Census Office, and considerable improvement in the quality of the returns has resulted.

Census Methods.—The operations of the census are manifold, and can be stated only in the briefest manner. Preliminary steps are the preparation of the schedules and the division of the country into enumeration districts. The schedules are sometimes minutely prescribed by law, but the better way is for the act to enumerate the points to be covered and leave the formulation of the questions to the experience and discretion of the census authorities. The country must be divided into well-defined enumeration districts, containing approximately the same number of persons, and not too extensive to be fully covered by the enumerator in the time allotted to him. In countries where the census is taken in a single day, the districts must of necessity be smaller than in the United States, where two weeks are given the enumerator in cities, and a month in rural districts. After he has completed his work his papers are sent to Washington for examination and tabulation. In 1890 the work of tabulation was done by electrical machines, the invention of Mr. Herman Hollerith. These machines have now acquired a permanent place in census work. The facts recorded on the schedules are drawn off by a punching machine on cards, where each perforation represents some one of the characteristics noted on the schedules. Such a card is prepared for each individual. The cards are placed in a holder and brought into contact with a large number of points corresponding in location to the perforations. If there is a hole in the card the point passes through, establishes a current, and makes a record upon a recording dial. The points which touch the cards at places where there are no perforations are pushed back by springs and return into place when the card is taken out. By means of this machine the count is made with unerring accuracy and the number of combinations of the different data is greatly increased. It will be readily understood, if it has not been expressly stated, that a modern census of population is something more than a statement of the number of the people. The facts usually embraced in census inquiries relate to sex, race, age, nativity, citizenship, conjugal condition, occupation, literacy, and, in foreign countries, religious belief. The geographical distribution of the people gives another and most important element. These various elements in conjunction with the geographical detail furnish an almost endless variety of combinations. The result is a minute analysis of the population from these various points of view.

The Scope of Census Enumerations.—The decennial census authorized by the Constitution has from the beginning been utilized to secure in-

formation beyond the mere number of inhabitants, which would have satisfied the constitutional requirement. This tendency showed itself first in the elaboration of the population schedules already noted, but as early as 1810 additional inquiries were introduced. As time progressed these became very numerous and reached their culmination in 1890, when, among 25 volumes which contained the results of the census, two only relate to the count of the population. The multiplication of inquiries was thought to retard the progress of the main investigations, and by the law governing the census of 1910 the enumeration was limited to population, agriculture, manufactures, mines, and quarries. The last subject had not been included in the census of 1900, but a special census of mines and quarries had been taken for 1902 under the provisions of the permanent census act. The inquiry as to mortality, first incorporated in the census in 1850, was abandoned in the census of 1910. Census returns on mortality are notoriously defective, except for the registration area, from which data are to be had by other than census methods.

The census of 1910 was taken under a law of 1909, entitled "An Act to provide for the Thirteenth and subsequent decennial Censuses." It provided for the expansion of the force of the permanent census bureau for the period July 1, 1909, to June 30, 1912. As a result of administrative difficulties and inadequate appropriations, the work of the census failed of completion in the period set by the law.

Agriculture first appeared as a subject of inquiry in 1840, when a few general questions as to the value of farm crops were asked. In 1850 we find a special schedule for farmers, but the range of the inquiry was not materially increased though the form of question was much improved. In 1880 the scope of the inquiry was greatly widened and special inquiries concerning cereals and forestry were undertaken. The development of the census has been more in the details of publication than in change of method.

The history of manufacturing statistics dates back to the census of 1810. Without instructions or definite schedules, the marshals were directed to report upon the manufactures in their districts. The mass of heterogeneous material which resulted could not be gathered together into statistics, though they formed the basis for a general statement by Mr. Tench Coxe, in which estimate and conjecture were freely used to supplement defects of the data. The following census of 1820 had a better schedule, but results were hardly more satisfactory. Indeed, so general was the discontent with the figures that in 1830 the inquiry was abandoned. While an attempt was again made in 1840 to collect such statistics, it was not until 1850, with a reorganized census service, that valuable results were secured. The separate schedule for manufacturing and mechanical industries adopted in 1850 was in form substantially the same as that now in use. It has been gradually expanded and improved. In 1880 the industrial schedules were confided to special agents in cities and manufacturing districts. With the census of 1880 was incorporated a large number of special inquiries, and for the more important industries a mass of specifically appropriate matter was collected.

A permanent census bureau, under the Director of the Census, was established by a law of

1902. It publishes bulletins, special reports giving further analysis of the data of the decennial census, and other statistical material.

Bibliography. The fullest account of the census of the United States is found in an official publication, Wright and Hunt, *The History and Growth of the United States Census* (Washington, 1900). Consult also W. R. Merriam, *American Census Taking from the First Census* (Washington, 1905), and *The Federal Census*, by a Committee of the American Economic Association (New York, 1899). For the methods of European countries, the most useful compilation is Bodio, *Studi preparatorii per il IV censimento decennale della popolazione del regno* (Rome, 1892), the author of which was the Director of the Italian Statistical Bureau. Dr. Bertillon, chief of the Municipal Statistics of Paris, has published *Statistique internationale résultant des recensements de la population dans les divers pays d'Europe* (Paris, 1899).

CENSUS, ROMAN. See CENSOR.

CENT (Fr. *cent*, from Lat. *centum*, hundred). A coin of the United States valued at the one-hundredth part of a dollar. The division of the coinage unit into hundredths is quite frequent; and names indicating this division are found in the *centime* of France, the *centesimo* of Italy, the *centavo* of the South American republics, and the *cent* of Holland. In Belgium the coins of one and two centimes are popularly known as cents. In the United States the use of the word "cent" dates from the Act of Congress of 1786 which adopted the dollar of one hundred cents as the coinage basis of the United States. While in Colonial times dollars (Spanish) were frequent in the circulation, the minor coins in use were either English coppers or homemade substitutes for them. In 1787 a mint established by Congress at New Haven, Conn., began coining what are known as the "Fugio" or "Franklin" cents, which were issued for many years. In 1791 a coin bearing a head of Washington and the words "one cent" was struck in England as a pattern piece, and in 1792 another, without the word "cent," both of these meeting with the President's modest disapproval. In 1792 (April 2) Congress authorized the issue of a copper cent of 264 grains, and a half-cent in proportion. These appeared in 1793, the cent being reduced to 208 grains. In 1796 (Act of January 26) the weight of the cent was reduced to 168 grains and the half-cent was proportionately reduced, a new design being adopted also. The head of Liberty was changed in 1808, and again in 1816. In 1815 and 1835 no copper coins were issued. By Act of March 3, 1851, a three-cent coin, three-fourths silver, was authorized, and in 1853 its weight was reduced from 12½ grains to 11.52 grains. By Act of Feb. 21, 1857, the half-cent was discontinued, and the old copper cent was replaced by a smaller coin, composed of .88 copper and .12 nickel, and weighing 72 grains. In 1864 (Act of April 22) the bronze cent was introduced, weighing 48 grains, and consisting of .95 copper and .05 tin and zinc. By the same Act the one and two cent coins were made a legal tender for sums not exceeding 10 and 20 cents respectively, and the coinage of two-cent pieces to weigh 96 grains was authorized. In 1865 (Act of March 3) the one and two cent coins became each a legal tender to the amount of 4 cents only, and a three-cent coin was authorized,

to consist of three-fourths copper and one-fourth nickel, to weigh 30 grains, and to be legal tender for any sum not exceeding 60 cents. In 1866 (May 16) a new Act provided for the coinage of a five-cent piece, three-fourths copper and one-fourth nickel, to weigh 77.16 grains, and to be a legal tender for any sum not exceeding \$1. The "Coinage Act of 1873" (February 12) discarded the two-cent piece and limited the issue of coins of the denomination of cent to a five-cent piece and a three-cent piece (three-fourths copper and one-fourth nickel, and weighing 77.16 and 30 grains respectively), and a one-cent piece (.95 copper and .05 tin and zinc, weighing 48 grains). The coins authorized by this Act were made a legal tender at their nominal value for any amount not exceeding 25 cents in any one payment. The minor coinage was further simplified by the discontinuance of the three-cent piece by Act of Sept. 26, 1890. The cents issued in 1793, 1799, and 1804, and the copper cent of 1856 are very rare, as are the half-cents of 1793, 1831, 1840-48, and 1852. See NUMISMATICS.

CENTAUREA (Neo-Lat., from Lat. *centauria*, Gk. *κενταύριον*, *kentaureion*, from Gk. *κένταυρος*, *kentauros*, centaur). A genus of plants of the family Compositæ, containing at least 400 species of annual and perennial herbaceous plants, chiefly natives of the Mediterranean regions and Australia. The cornflower, bluebottle, or corn bluebottle (*Centaurea cyanus*), is common in grain fields in Europe, and has escaped from gardens in parts of the United States. The juice of the florets of the disk, with a little alum, dyes a beautiful and permanent blue. The large bluebottle (*Centaurea montana*), a native of central Europe, is frequently cultivated in flower gardens. Its flowers are considerably larger, and it is a perennial. Sweet sultan (*Centaurea moschata*), a native of the Levant, with fragrant flowers, is also common in flower gardens. It is an annual or biennial. Several species having the involucre spiny bear the name of star thistle, *Centaurea calcitrapa* being most widely known.

CENTAURS (Lat. *Centauri*, Gk. *Κένταυροι*, *Kentauroi*, of uncertain etymology). A race of



CENTAUR.

monsters, half man and half horse, which Greek legend localized in Thesaly. Such monsters are very early represented in Greek art, armed with a double-headed axe or branches of trees, and frequently in combat with an archer. Two main types may be distinguished. In one a human body from the waist upward is joined to the body and four legs of a horse; in the earlier type the fore legs are also human, and the hinder parts only are equine. Greek legend knows two good centaurs, Chiron and Pholus; but the others are represented as savage and lustful. They appear most often in

battle with the Lapithæ (q.v.), or with Hercules. In later art they appear in the Dionysiac circle, drawing the chariot of the god, plagued by cupids, or in company with satyrs and nymphs. Consult Baur, *Centaurus in Ancient Art, The Archaic Period* (Berlin, 1912).

CENTAURUS (Lat., from Gk. *Κένταυρος*, *Kentauros*). The Centaur, a southern constellation, represented on the celestial globe by a form half man and half horse. The principal star in this constellation, α Centauri, has been found to have a larger parallax (q.v.) than any other fixed star. In other words, α Centauri is nearer to us in space than any other star. The difficulty of measuring stellar distance is so great, on account of the extreme delicacy of the necessary observations, that it was not until 1838 that such measurements were rendered possible by Bessel, who determined the parallax of 61 Cygni with great precision. In the very next year Henderson, at the Cape of Good Hope Observatory, measured the parallax of α Centauri, but his results have since been replaced by the more accurate heliometric observations of Gill and Elkin, made at the same observatory in 1881-83. These astronomers make the distance 4.3 light years, a "light year" being the distance traversed by light in one year. When we remember that light moves with a velocity of 186,330 miles a second, we can form some idea of the immense distance separating us from our nearest neighbor among the fixed stars.

CENTAURY (Lat. *centauria*, Gk. *κένταυρον*, *kentaureion*, from Gk. *κένταυρος*, *kentauros*, centaur; so called because it was supposed to have healed the wounded foot of the centaur Chiron), *Erythræa*. A genus of plants of the family Gentianaceæ, having a funnel-shaped regular five-parted corolla. The species are pretty little annuals, natives chiefly of the temperate parts of Europe and Asia, with pink or rose-colored flowers. They possess the tonic and other medicinal virtues of gentian, and although not frequently administered by physicians, are an important domestic medicine; and the tops are collected, when the plant is in flower, by the country people both in England and on the continent of Europe, to be employed in cases of dyspepsia, in intermittent fevers, and as a vermifuge. They contain a substance called *centaurin*, the hydrochlorate of which is said to be an excellent febrifuge. The common centaur (Erythræa centaurium) is the species most frequent in Great Britain, a plant of 8 inches to a foot in height, with flowers collected in loose heads, growing in dry pastures. Two or three other species are found on sandy seashores. Nearly allied to these is the American centaur (*Sabbatia angularis*), an annual plant with an erect, quadrangular stem, extensively distributed throughout the United States and Canada, and much used in the domestic practice of America as a prophylactic against autumnal fevers in strong infusions and large and repeated doses. There are more than a dozen species of *Sabbatia* in the United States, and the European species of centaur are introduced to some extent in waste grounds.

CENTENARY (Lat. *centenarius*, consisting of a hundred, from *centeni*, numbered by hundreds, from *centum*, hundred). A hundred of anything; a period of a hundred years; but usually employed to denote the commemoration of an important event. The centenary of Ameri-

can independence was celebrated by a *centennial* exhibition in 1876; the *bicentenary* of Pope's birth in 1888; the *tercentenary* of Shakespeare's birth in 1864; the *octocentenary* of the Bologna University in 1888. See MILLENNARY.

CENTENNIAL EXHIBITION, INTERNATIONAL. An international exhibition of arts, manufactures, and products of the soil and mines, held in Philadelphia, Pa., from May 10 to Nov. 10, 1876. The exhibition was designed as a celebration of the one hundredth anniversary of the Declaration of Independence, and to illustrate the progress and industrial development which had taken place since that event. The project was originally proposed by an association of citizens of Philadelphia in 1870, and was officially authorized by Congress on March 3, 1871, when a centennial commission, of which Joseph R. Hawley became president, was named by President Grant. This commission, on May 12, 1873, appointed Alfred T. Goshorn director general, under whose immediate direction the various subordinate officers were then chosen. The funds for the exhibition were obtained from the following appropriations: City of Philadelphia, \$1,500,000; State of Pennsylvania, \$1,500,000; Congress, \$1,500,000; and private subscriptions, \$2,300,000. A site in Fairmount Park, comprising an area of 236 acres, was inclosed, within which more than 200 buildings were erected. Of these, the Main Building, a structure of iron and glass, was designed for the exhibition of manufactures, products of mines and metallurgy, and various objects showing the development of science and education of all nations. It covered an area of 20 acres, and was 1880 feet long by 464 feet wide; Machinery Hall, next in size, was 1402 feet long by 360 feet wide, and was constructed of wood, with iron ties and struts into large traces upon tiers of solid masonry; Agricultural Hall was 820 feet long by 540 feet wide, and was of wood and glass; Horticultural Hall, of iron and glass, in the Moorish style of architecture, was 383 feet long by 193 feet wide; and Memorial Hall, of granite, glass, and iron, in the modern Renaissance style of architecture, was used as an art gallery, and was 365 feet long by 210 feet wide and 89 feet in height, costing \$1,500,000. This building was constructed in permanent form, and is now the Pennsylvania Museum of Art. The smaller buildings were erected at the expense of various countries, States, and individual firms. In accordance with an Act of Congress of June 5, 1874, the President invited foreign governments to be represented and take part in the international exhibition. Forty-nine foreign governments and dependencies responded to this invitation; and many, in addition to sending important exhibits of their products, erected buildings on the grounds for the use of their respective commissions.

The exhibits, of which there were upward of 50,000, were classified in 36 groups, each of which was subdivided into classes, and these in turn were again subdivided into smaller divisions. They were examined by a jury of awards, of which Francis A. Walker was chief, composed of 233 judges, of whom 118 were foreign and 115 American. Awards, consisting of a diploma and a medal, were granted to 13,104 exhibitors, 7802 being given to foreign countries and 5302 to the United States. The total number of admissions was 9,910,966, of which 8,004,274 were paid. The largest number of persons

admitted on any one day was on Pennsylvania Day (September 28), when 274,919 persons entered the grounds. During the exhibition the governors of the various States were invited to accompany excursions to the fair, where usually receptions were held in the State buildings. By such means, interest was stimulated, and citizens generally took advantage of these excursions to visit the exhibition. Representatives from each State and Territory were invited to deliver addresses upon its history, progress, present condition, and resources; also various organizations held meetings on the exhibition grounds on special days. There were, also, the following official ceremonies connected with the exhibition: Opening exercises, on May 10; centennial celebration of the Declaration of Independence, on July 4; distribution of awards to exhibitors, on September 27; and closing exercises, on November 10.

The Centennial Exhibition marked an important stage in the industrial development of the United States, as well as in the growth of industrial expositions generally. Coming, as it did, at a time of prosperity following the Civil War, it offered an opportunity for individual manufacturers to show the great advances that had been made under the stimulus of the demands of active trade. It was, moreover, the first opportunity where the products and manufactures of every section of the United States were so brought together as to give a concrete representation of the material resources and capacities of the nation as a whole. The international aspect given to the exhibition by the coöperation of foreign countries served to emphasize the closer commercial relations that were being established between the United States and various distant nations. From South America and the Far East came extensive exhibits; and it may be mentioned as a single consequence that articles of Japanese manufacture became well known in the United States for the first time, and soon entered into extensive use for decorative and other purposes. The fine quality of many goods exhibited by European makers was impressed upon American manufacturers, and an important result was the tendency to adapt their labor-saving and more rapid machinery to the manufacture of higher grades and more ornamental products. The bringing together of important works of art also was an event of importance to the American people, whose art galleries and academies were at that time in little more than a formative state. Greatest of all the lessons learned from the exhibition was the realization, not only of the great progress, but of the extended and diverse resources of the nation, together with its homogeneity and potentiality in industrial matters, in spite of the then recent war, devastating a large and important territory. As the exhibition was visited by numerous visitors from abroad, these facts were equally patent to them and served to demonstrate to the world the extent of the development of the United States. Regarded in its larger aspect, the Centennial Exhibition illustrated conditions existing at a time when the changes wrought by the development of rapid communication and the extended use of mechanical power in various industries were clearly indicated. The railway, telegraph, and post office had already bound the world closely together, so that a more intimate acquaintance among nations and easier inter-

change of goods was possible. The use of steam and inventive genius had effected transformations in manufacturing, and the methods in vogue in the United States were now brought to the serious attention of Europe. As an exhibition, the Centennial was organized on a larger scale and on a more truly international basis than any previously attempted, and as a result its success was extraordinary. Being the first exhibition of the kind in the United States, it paved the way for subsequent undertakings which have proved as successful. See EXHIBITIONS, INDUSTRIAL.

The history of the exhibition is given in a series of nine volumes published by the Department of State (Washington, 1880), of which vols. i and ii are devoted to the reports of the director general and the chiefs of the bureaus of administration; vols. iii to viii, which were edited by Francis A. Walker, to a description of the exhibits; and vol. ix, a quarto volume, by Dorsey Gardner, to the grounds and buildings.

CENTENNIAL STATE. Colorado. See STATES, POPULAR NAMES OF.

CENTENO, *thân-tă'nô*, DIEGO (c.1505-49). A Spanish soldier, born at Ciudad Rodrigo. In 1534 he went with Pedro de Alvarado to Peru, where he contended against the elder Almagro at Las Salinas (1538), and the younger Almagro at Chupas (1542); made himself master of part of the country by killing the tyrannical Alman-dras; and in 1544 declared against Gonzalo Pizarro and on the side of the Viceroy. He was, however, several times defeated by Carabajal and, his army being disbanded, was compelled to seek refuge in a cave near Arequipa. On the arrival of Gasca, the envoy of Charles V, Centeno collected an army in support of the Royalist cause in Charcas, but was again defeated (Oct. 20, 1547) by Pizarro and Carabajal at Huarina. In the following year he contributed to the final defeat of Pizarro, towards whom he displayed more clemency than did the other Royalists. His death, at La Plata, just after he had been appointed Governor of the Río de la Plata, is said to have been caused by poison administered at a banquet by officers who feared the revelations which he had purposed to make to the King.

CENTER. See CENTRE.

CENTERING. See CENTRING.

CENTERVILLE. A city and the county seat of Appanoose Co., Iowa, 89 miles northwest of Keokuk, on the Chicago, Burlington, and Quincy, the Chicago, Rock Island, and Pacific, and the Southern Iowa Traction Company railroads (Map: Iowa, E 4). The city has a park, a public hospital, and a public library. Coal, gypsum, and limestone underlie the vicinity, and large quantities are shipped. The exportation of live stock is an important industry, and there are railway shops and manufactures of lumber, flour, iron, skirts, crushed rock, etc. Settled in 1847, Centerville was incorporated in the following year. Its government is administered by a mayor, elected biennially, and a city council. Pop., 1890, 3668; 1900, 5256; 1910, 6936.

CENTERVILLE. A town and the county seat of Queen Anne Co., Md., 30 miles (direct) east by north of Annapolis, on the Cor-sica River, at the head of navigation, and on the Maryland, Delaware, and Virginia, and the Philadelphia, Baltimore, and Washington railroads (Map: Maryland, N 4). The town is in

a fertile agricultural and peach-growing district, and has carriage works, machine shops, canning factory, and a creamery. Centerville has adopted the commission form of government and owns its electric lighting plant and water works. Pop., 1900, 1231; 1910, 1435.

CENT-GARDES, sän'gård'. The title of a special bodyguard instituted by Louis XI of France in 1474, consisting of 100 nobles, acting as guards of the palace, each of whom maintained two archers. The latter were later developed into the *gardes du corps*. The Cent-Gardes were disbanded in 1727 by Louis XV, restored by Napoleon III, and finally dissolved at the fall of the Empire.

CENTIGRADE SCALE (Fr., from Lat. *centum*, hundred + *gradus*, degree). A scale for thermometers where the zero is fixed at the freezing point of water, and the 100° point at the temperature at which water boils under an atmospheric pressure of 760 millimeters (30 inches). See THERMOMETRY and THERMOMETERS.

CENTIME, sän'tém' (from Lat. *centesimus*, hundredth, from *centum*, hundred). In the French monetary system, the hundredth part of a franc.

CENTIMETER-GRAM-SECOND SYSTEM. See C. G. S.

CENTIPEDE, or **CENTIPED** (Lat. *centipeda*, *centipeda*, from *centum*, hundred + *pes*, foot). Centipedes belong to the order Chilopoda, one of the two principal groups of the Myriapoda, and in some places are popularly known as "galleyworms." They have fewer segments in the body than the Chilognatha, the millipedes, in which respect they more closely approach spiders and insects; a centipede, indeed, is like a primitive insect in structure. The form of the body is flattened, has more concentration headward than in the millipedes, and each segment bears one pair of legs. In counting the segments, the ventral surface should be observed, for the dorsal shields often overlap. The head, covered by a flat shield, bears a pair of long antennæ, a pair of small, strong mandibles, and a pair of underjaws; and it contains poison glands, the venom being emitted through a pair of modified legs.

Habits and Habitat.—Centipedes are active and ferocious. All are fond of dark and damp places, and stay by day under stones and bark, in decaying wood and leaves, or in loose soil. They go in search of food by night, devouring worms, mollusks, and insects, which they are able to pursue with much persistence, guided almost wholly by the sense of touch, for their powers of vision are at the best poorly developed. Only one family, Scutigera, has compound eyes. In the other forms the eyes are simple or absent. According to Plateau, centipedes can distinguish light from dark, but, since they are night prowlers, the blind forms seem to get on as well as the others. As destroyers of insects, etc., centipedes are, therefore, of practical importance to agriculture. The smaller forms seldom, if ever, bite man, and the poison is never fatal. The bite of the large tropical forms, however, is painful and serious. According to Humboldt, the children of South American Indians tear off the head and eat the remainder of the body.

Classification and History.—Four families are distinguished—viz., Scutigera, Lithobiidae, Scolopendridae, and Geophilidae. To the Scuti-

geridae belong long, stout myriapods, and the genus *Scutigera* is distinguished by its long legs, but is rare in the United States north of New York City. The body of the Lithobiidae is unevenly jointed. The genus *Lithobius* is of world-wide distribution, *Lithobius forficatus* inhabiting both Europe and America. The Scolopendridae usually have four ocelli and from 17 to 20 jointed antennæ. To the genus *Scolopendra* the large-jointed centipedes belong, such as the giant centipede (*Scolopendra gigantea*) of tropical America and the West Indies. The Geophilidae have from 30 to 200 segments, the typical genus (*Geophilus*) inhabiting both Europe and America, under stones and decaying wood. One European species is phosphorescent. The centipedes appeared later in geological times than the millipedes. A *Geophilus* occurs in the Lower Carboniferous of Nova Scotia and the coal formations of Germany, and the order is well represented in Tertiary times. Compare MILLIPEDE; and for bibliography, etc., see MYRIAPODA.

CENTLIVRE, sânt-liv'ér or lé'vër, SUSANNA (c.1667-1723). An English dramatist, the daughter of a Lincolnshire gentleman named Freeman, born (most probably) in Ireland. Her early history is obscure; but when 16 years of age she won the heart of a nephew of Sir Stephen Fox, who, however, died shortly after their marriage. Her second husband (an officer named Carrol) lost his life in a duel. Left in extreme poverty, his widow endeavored to support herself by writing for the theatre, and after producing a tragedy called *The Perjured Husband*, made her appearance on the stage. She afterward married (1706) Joseph Centlivre, principal cook to Queen Anne. Of her plays, *The Busybody*, in which the leading character, Marplot, is highly amusing (1709); *A Bold Stroke for a Wife* (1718); and *The Wonder* (1714), in which Garrick found one of his best parts,—though not distinguished by purity of style or truthfulness of portraiture, are lively in their plots, and have kept their place on the stage. Her collected *Dramatic Works* appeared in 1761 (3 vols.); new edition containing an account of her life (London, 1872).

CENT NOUVELLES NOUVELLES, sän nō'vèl' (Fr., hundred new stories). A collection of French tales, many of them taken from the works of Italian novelists, first printed by Vêrard, in an undated folio, from a manuscript of the year 1456. Boccaccio and Poggio are the principal sources. The tales were originally written for the court of Burgundy, probably at the direction of Philip the Good. Antoine de la Salle had some part in collecting and editing them. They were republished in Paris in 1858, under the editorship of Thomas Wright. They are marked by an extremely cynical and obscene wit.

CENTO (Fr. *centon*, It. *centone*, from Lat. *cento*, patchwork, Gk. *κέντρον*, *kentrôn*, patchwork, from *κέντρον*, *kentrôn*, pin, from *κεντείν*, *kentein*, to prick). A name applied to poems manufactured by putting together distinct verses or passages of one author, or of several authors, so as to make a new meaning. After the decay of genuine poetry among the Greeks, this worthless verse manufacture came into vogue, as is proved by the *Centones Homerici* (q.v.); but it was much more common among the Romans in the later times of the Empire, when Vergil was frequently abused in this fashion, as in the

Cento Nuptialis of Ausonius (who gives rules for the composition of the cento), and especially in the *Cento Vergilianus*, constructed in the fourth century by Proba Falconia, wife of the proconsul Adelfius, and giving, in Vergil's misplaced words, an epitome of sacred history. The cento was a favorite recreation in the Middle Ages. In the twelfth century a monk named Metellus contrived to make a cento of spiritual hymns out of Horace and Vergil. Consult Delepierre, *Tableau de la littérature du centon* (London, 1874-75).

CENTO, chên'tō. A city in northern Italy, 16 miles north of Bologna, situated in a fertile plain, on the left bank of the Reno (Map: Italy, F 3). It has a former palace of Count Chiavelli-Pannini, and in the churches are many paintings by Guercino (q.v.), whose interesting house is still shown, and whose statue adorns the principal square. Cento is connected by canal with San Giovanni and with Ferrara, and is a hemp and rice market. Pop. (commune), 1881, 17,000; 1901, 19,118; 1910, 23,907.

CENTO/NES HOMER/ICI, or HOMER/OCENTON/ES (Lat., Homeric centos, translation of Gk. Ὅμηροκέντρανες, *Homērokenētrōnes*, or Ὅμηροκέντρα, *Homērokenētra*, from Ὅμηρος, *Homēros*, Homer + κέντραν, *kenētrōn*, cento). A cento (q.v.) on the life of Christ, made up of Homeric hexameters. It dates probably from the fifth century, and was printed by Aldus in 1501, by Stephens in 1568, and edited by Teucher (Leipzig, 1793). It has been ascribed to the Empress Eudocia.

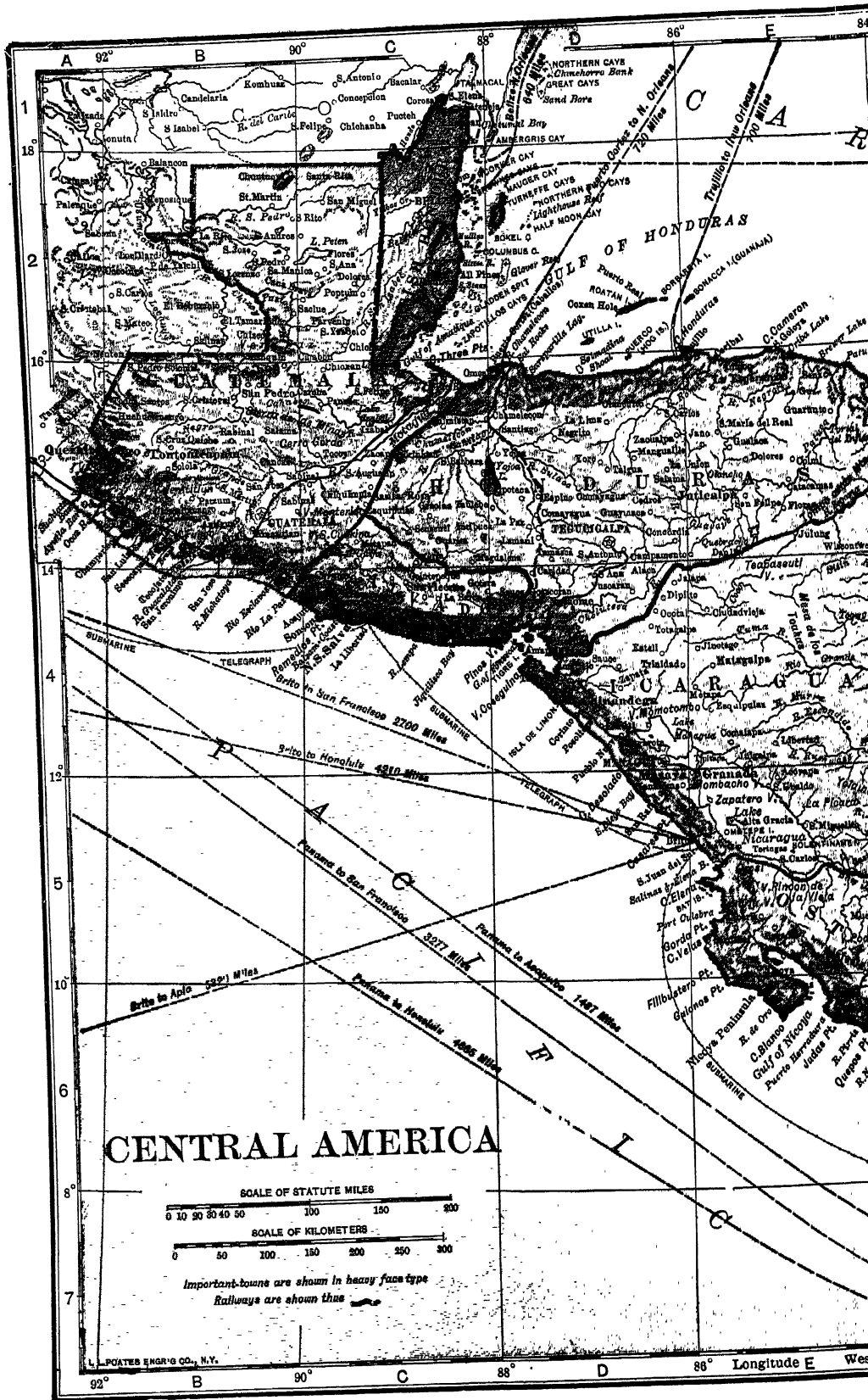
CENTO NOVELLE ANTICHE, chên'tō nō-vēl'lā ān-tē'kā (It., hundred old stories). A collection of tales belonging to Italy and the thirteenth century. They are founded variously on historical events and mediæval romances and tableaux. See ITALIAN LANGUAGE AND LITERATURE.

CENTORBI, chên-tōr'bē. The former name of the Sicilian city Centuripe (q.v.).

CENTRAL AMERICA. That portion of the American continent between Mexico on the north and Colombia on the south, embracing the states of Costa Rica, Nicaragua, Salvador, Honduras, Guatemala, Panama, and the colony of British Honduras (Map: World, Countries, M 8—special map). It extends from lat. 8° to 18° 30' N., and has an area estimated at about 181,500 square miles. Where it joins the Isthmus of Panama, now crossed by the Panama Canal (q.v.), the distance between the Atlantic and the Pacific is reduced to about 75 miles. It is in general a mountainous region, the elevations reaching about 13,000 feet in the north, and over 11,000 feet in the south. The interrupted mountain chain along the west coast is, in a sense, the connecting link between the cordilleras of North and South America. The chain includes numerous volcanoes, which have ejected enormous quantities of lava and ashes. There are two extensive lakes, those of Nicaragua and Managua. The west coast of Central America is bold and steep, but most of the eastern coast lies at low altitudes. The population is chiefly of mixed Spanish and Indian blood. The prehistoric remains are of great interest. See ARCHAEOLOGY, AMERICAN.

History. The coast of Central America was first sighted by Columbus on his fourth voyage, in August, 1502. After 1513 a part of what is now Costa Rica was conquered by Pedro Arias de Ávila. From 1522 to 1525 the country was in

dispute between Ávila and Cortés, who, after the conquest of Mexico, dispatched Alvarado to subdue Guatemala (1523-24). Cortés himself invaded the country in 1524-25, completing its subjugation. All of Central America constituted the Captain-Generalcy of Guatemala until 1821. In that year Guatemala proclaimed its independence, and in 1822 the five audiencias, corresponding to the present five states, were united to the Mexican Empire of Iturbide. They regained their independence soon after, and in July, 1823, constituted themselves the Republic of the United States of Central America. From the first there was a bitter conflict between the Federalist element, which was strongest in Honduras, and the Conservative party, comprising the clergy and the old Spanish bureaucracy, which were opposed to centralization, their stronghold being Guatemala. The struggle between these two elements has persisted to the present day and has shown itself in the numerous unsuccessful attempts to establish a federated Central America. The Liberals were in the ascendant up to 1839, under the leadership of General Morazán. In 1839, however, the union was dissolved, as the result of the successful uprising of the Conservatives of Guatemala under Carrera. General Morazán made an attempt to restore the federal republic, but was captured and shot in Costa Rica in 1842. In that year a new union of all the states, excepting Costa Rica, was brought about, but this was dissolved in 1845. Costa Rica, in general, took very little part in the political affairs of Central America. In 1850 Honduras, Salvador, and Nicaragua endeavored to restore the republic by force, but their armies were overthrown in the following year by Carrera. It was during the period of disturbances which followed the victory of Guatemala that the filibuster Walker (q.v.) made his audacious attempts to seize the government of Nicaragua (1856) and Salvador (1860). Of subsequent efforts to establish a federated republic in Central America, the most important were those of Barrios, President of Guatemala, who resorted to force (1885) and perished in the attempt, and the peaceful union formed in 1895 by Nicaragua, Salvador, and Honduras, which combined to form the Greater Republic of Central America, with provisions for the admission of Guatemala and Costa Rica. A constitution was adopted in 1898, but owing to the dissatisfaction of Salvador, the union was soon dissolved. Great Britain, in 1865, extended her protection to the Mosquito Coast, which was relinquished in 1850. Through colonization British Honduras was established in that year. In 1903 the revolt and independence of Panama added another to the list of Central American republics. From the Washington Peace Conference of 1907 dates a new era of interstate relations in Central America. The organization of the Central American Court at Cartago in 1908, for which Andrew Carnegie provided the building, has solved disputes and promoted co-operation. The first decision was in 1909. In the same year the First Central American Conference laid the basis of a uniform monetary, metric, fiscal, and consular service agreement. The Sixth Conference meeting in January, 1914, carried these recommendations even further and added plans for agreements as to international highways, postal and telegraphic regulations, and coasting trade, as well as the establishing of a central pedagogic institute and a central com-



mission of foreign relations. It also proposed removing the Court of Justice from Cartago. At the date of this conference no united action had yet been taken to realize the plans of previous conferences. Consult: Enock, *Republics of Central and South America* (London, 1913); Fortier and Ficklen, *Central America and Mexico* (Philadelphia, 1907); Keane, *Central and South America* (London, 1909); and his *Central America and the West Indies* (ib., 1901); W. L. Scruggs, *Colombian and Venezuelan Republics; with Notes on Central America* (Boston, 1905); Carranza, *Digesto constitucional americano* (Buenos Aires, 1900-01); Child, *Central American Republics* (London, 1892); H. H. Bancroft, *History of Central America* (3 vols., San Francisco, 1881-87); Squier, *The States of Central America* (New York, 1858); Crechfield, *American Supremacy* (New York, 1908); "The United States and Latin America," in *Annals of the American Academy of Political and Social Science* (1903); Moncado, *Social and Political Influence of the United States in Central America* (n.p., 1911, from the Spanish). See AMERICA; BRITISH HONDURAS; COSTA RICA; GUATEMALA; HONDURAS; NICARAGUA; PANAMA; SALVADOR; MOSQUITO COAST.

CENTRAL CITY. A city and the county seat of Gilpin Co., Colo., 40 miles west by north of Denver, on the Colorado and Southern Railroad (Map: Colorado, E 2). It is the centre of supply for a rich mining district, and has gold mines. The first discovery of gold in paying quantities in the State was made here. Central City was settled in 1859, and was incorporated in 1864. The government is administered by a mayor, biennially elected, and a city council. There are municipal water works. Pop., 1890, 2480; 1900, 3114; 1910, 1782.

CENTRAL CITY. A city in Muhlenberg Co., Ky., 35 miles northwest of Bowling Green, on the Illinois Central, the Louisville and Nashville, and the Kentucky and Midland railroads, and on the Green River (Map: Kentucky, C 5). It is in a coal-mining region, and is the commercial centre of the vast bituminous coal fields of western Kentucky. The city contains a public library and railway repair shops. Pop., 1890, 1144; 1900, 1348; 1910, 2545.

CENTRAL CITY. A city and the county seat of Merrick Co., Neb., 132 miles west of Omaha, on the Union Pacific and the Chicago, Burlington, and Quincy railroads, and on the Platte River (Map: Nebraska, G 3). It is in a productive agricultural and stock-raising region and ships cattle. The city contains the Nebraska Central College (Friends) and owns its water works and power plant. Pop., 1900, 1571; 1910, 2428.

CENTRAL FALLS. A city in Providence Co., R. I., 5 miles north of Providence, on the New York, New Haven, and Hartford Railroad, and on the Blackstone River (Map: Rhode Island, C 2). Central Falls has a public library and parks and obtains its water supply from Pawtucket, though it owns the pipe system by which the water is supplied. It has extensive manufactures of cotton, woolen, and silk goods, haircloth, glass, and machinery. The city, formerly included in the town of Lincoln, was incorporated in 1895. Under its present charter, the mayor and the city council are elected biennially, the latter being a bicameral assembly. The executive, with the consent of the board of aldermen, nominates police officers, and the

school committee is chosen by popular election; except in these departments, all officers are selected by the council. Pop., 1900, 18,167; 1910, 22,754; 1920, 24,174.

CENTRAL FORCES. Forces which produce on a moving body an acceleration towards a fixed point called the "centre of force." Illustrations are afforded by the motion of a stone whirled in a sling, by the motion of the moon with reference to the earth, or of the earth with reference to the sun. It is evident, since the line of action of the force is through a fixed point, that the moving body will always move in a definite plane, and that the moment of the force around a line through the fixed point perpendicular to this plane being zero, there is no change in the angular momentum around this line. (See MECHANICS.) This leads at once to what is called the principle of the "conservation of areas," or the statement that, if a radius vector be drawn from the fixed point to the moving body, it will describe equal areas in equal intervals of time; thus, the nearer the body is to the centre, the greater must be its speed.

It can be shown further that, if the force is an attraction varying inversely as the square of the distance from the centre to the body, the orbit of the body will be an ellipse, hyperbola, or parabola, depending upon the conditions under which the motion may be regarded as being started, the centre of the force being a focus. If the orbit is elliptical, it may be shown that the square of the period of revolution of the body in its orbit is proportioned to the cube of the major axis of the ellipse. Consult Tait and Steele, *Dynamics of a Particle* (London, 1856).

The great astronomer Kepler, in 1609, by a careful consideration of the observations of Tycho Brahe on the motions of the planets, deduced the fact that these motions obey the three laws stated above; that is, they satisfy the conservation of areas, their orbits are elliptical about the sun as a focus, and the squares of their periods are proportional to the cubes of the major axes of the orbits. These are, therefore, often called "Kepler's laws." Sir Isaac Newton some years later showed that these laws were a necessary consequence of his principle of universal gravitation, which states that any two particles of matter act upon each other with a force of attraction which varies directly as the product of the masses of the particles and inversely as the square of their distance apart, and of the further principle that a large spherical body acts upon outside points as if its matter were concentrated at its centre.

CENTRALIA. A city in Marion Co., Ill., 62 miles (direct) east of St. Louis, Mo., on the Illinois Central, the Chicago, Burlington, and Quincy, the Southern, and the Illinois Southern railroads (Map: Illinois, C 5). Centralia has a large city hall, a Carnegie library, hospital, and parks. It is the centre of a noted fruit-growing country, in which commodity it has a large trade, especially apples and strawberries. Coal mining is an important industry, and there are also railway repair shops, flour mills, glass and bottling works, marble yards, a zinc smelter, shoe-heel factory, and manufactories of boxes, crates, shirts, overalls, envelopes, ice, and yeast. The water works are the property of the municipality. Settled in 1853, Centralia was incorporated in 1859, and is now governed under a general State law, which provides for a mayor,

elected biennially, and a city council. Pop., 1900, 6721; 1910, 9680; 1920, 12,491.

CENTRALIA. A city in Lewis Co., Wash., situated midway between Seattle and Portland, on the Centralia Eastern, the Great Northern, the Northern Pacific, and the Oregon and Western railroads (Map: Washington, C 4). It contains a Carnegie library and a fine high-school building. The city is in a fertile agricultural and fruit-growing region, has coal and fire-clay mines, and there are manufactures of gloves, canned goods, lumber, and dairy products. Centralia has adopted the commission form of government and owns its water works and electric light plant. Pop., 1890, 2026; 1900, 1600; 1910, 7311.

CENTRAL INDIA POLITICAL AGENCY.

The official name for a group of feudatory states in the centre of India, the principal of which are Gwalior, Indore, Rewah, Bhopal, Bhopawar, Bundelkhand, Baghelkhand, and Malwa. The total number in two residencies and six agencies includes 16 larger and 98 smaller states, covering 78,774 square miles. Pop., 1891, 10,318,812; 1901, 8,501,883; 1911, 9,356,980.

CENTRALISTS. A political party in Mexico, and some of the South American republics, which advocated the centralization of the government, as against a federalization of separate states. It has been a factor in Mexican politics since 1823; and the fight for the ascendancy between it and the Federalists has caused many revolutions in Spanish-American countries. See CENTRALIZATION; also MEXICO.

CENTRALIZATION. In political theory, a term used to denote the tendency on the part of a central authority to reserve to itself increasing powers of legislation and administration. More strictly interpreted, the word "centralization" is capable of bearing a double meaning. It may signify the complete unification of a political entity as opposed to a loose assemblage of quasi-independent members. In this sense we speak of a strongly centralized federal government as opposed to a mere confederation of states. In this sense, too, the term might be used to describe the absolute monarchy as contrasted with the lax organization of the mediæval state in which the element of nationality was practically made impossible by the feudal system. In its second meaning, centralization in a state already completely unified would describe the concentration of governmental functions in the supreme government in matters even of local interest. In no state, of course, is there any example of an absolutely centralized government, since in the nature of things some degree of power must be delegated to authorities provincial, municipal, and local, and thus in Russia, which stands as a type of autocracy, we find large powers of self-government enjoyed by the rural communes especially. In proportion only as the tendency towards centralization is stronger than the spirit of local self-government, can a government be spoken of as centralized or not. In ancient Rome the *municipia* possessed a very large measure of self-government under laws emanating from Rome. At the same time, so far as the broader aspects of government were concerned, the Empire was thoroughly centralized and was ruled from the Urbs as a unit. In the Middle Ages the power of the central governments, wherever there were such, was naturally small, and the privileges of provincial divisions, towns, and communes proportionately

large. Powers which are at present conceded to be within the province of the sovereign, even in the least centralized of modern states, such as the administration of public charity and public education and of justice, were, during the Middle Ages, relegated to the clergy and the territorial lords respectively. The growth of modern states has been in fact simply a great centralizing movement, but in certain countries the process of centralization has been more complete than in others. England stands as a type of the first class in which a way seems to have been found for reconciling a strong central organization with wide powers of local self-government. France may be taken as a type of the second class, where the administration even of communal affairs is in large measure regulated by the central government. In general, it may be said that the Latin countries, in which the traditions of the Roman Empire and the influence of the civil law are most strong, are more highly centralized than the northern nations of Europe.

CENTRAL PARK. See NEW YORK CITY.

CENTRAL PROVINCES AND BERÁR.

A chief commissionership of British India, created in 1861, and embracing the former Province of Nagpur, the two territories of Sagar and Nerbudda, and other territories added since (Map: India, D 4), the present designation dating from October, 1903. It is bounded by the Central India Agency and Chota-Nagpur on the north, Orissa on the east, Madras on the south-east, and Hyderabad and Bombay on the south-west and west. Its total area is 100,345 square miles, of which the portion under direct British administration contains 86,459 square miles. The surface is covered with numerous hilly ranges, among which the chief, the Satpura Range, enters from the west, runs in an easterly direction, and has numerous offshoots. The northern part belongs to the basin of the Nerbudda and forms a valley of about 10,000 square miles, with an average elevation of 1000 feet above sea level. The portion south of the Satpura Range is watered by the Wardha, Wain-ganga, and the Mahanadi rivers, and contains most of the cultivable land of the province. All of these rivers are navigable for some distance except during the dry season.

The climate is hot and dry, and the rainfall is generally satisfactory, but the soil absorbs the moisture so quickly that artificial irrigation becomes necessary in cultivation, and this is supplied mostly by tanks. Of the total area of the British possessions in the provinces, only about one-fourth is cultivated, while the rest is either unfit for cultivation or covered with forests and jungle. About one-third of the total area under cultivation consists of rice fields, while the remainder is under wheat and other food grains, oilseeds, and cotton. The mineral deposits consist chiefly of coal and iron. The manufacturing industries are but little developed and consist chiefly in the production of cotton goods and iron articles. The Central Provinces and Berár are traversed by the Indian Midland, Great Indian Peninsula, and Bengal railways.

The administration consists of a chief commissioner assisted by a secretary and a number of commissioners in charge of different departments. The British possessions are divided into the four divisions of Nagpur, Jabalpur, Nerbudda, and Chhattisgarh, each in charge of a commissioner. The tributary states are 15 in

number. In 1902 the government of India took Barār on lease in perpetuity at a rental of £187,000 annually to the Nizam of Hyderabad, incorporated the Hyderabad contingent in the Indian army, and in the next year annexed Barār to the Central Provinces under a resident commissioner.

Education is partly aided by the government and partly private. There are about 2300 schools of all kinds, of which only 300 are in the native states. The population of the British territory was 10,784,294 in 1891, 9,876,646 in 1901, and 13,916,308 in 1911. The native states had a population of 2,160,511 in 1891, 1,983,496 in 1901, and in 1911, 2,117,002. Nearly 82 per cent of the population is Hindu, over 16 per cent Animistic, and the remainder is made up of Mohammedans, Jains, and Christians. The chief town and seat of administration is Nagpur (q.v.).

CENTRAL STATE. Kansas. See STATES, POPULAR NAMES OF.

CENTRAL STATIONS. See ELECTRIC LIGHTING; TELEPHONE.

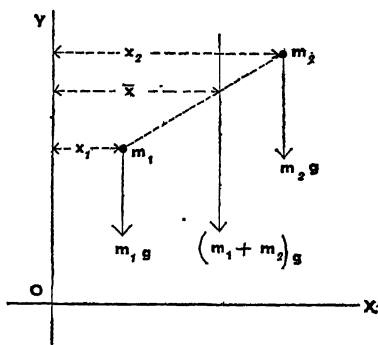
CENTRARCHIDÆ, sên-trâr'ki-dē (Neo-Lat., from Gk. *kéntron*, *kentron*, spine + *ἀρχός*, *archos*, anus). A family of fresh-water fishes of North America. It includes the various bass, sunfish, etc., all fishes of regular, well-balanced form, marked by a spot on the operculum. There are about 30 species, all gamey and voracious, and food fish of considerable importance. They build nests by cleaning away an area of gravel or sand, and watch them until the young are able to swim. See BASS; BREAM; CALICO BASS; CRAPPIE; ROCK BASS; SUNFISH.

CENTRE (Fr. *centre*, Lat. *centrum*, Gk. *kéntron*, *kentron*, centre, from *κενρεῖν*, *kentein*, to prick). A term variously used in mathematics. (For *centre of a curve*, see CURVE.) *Centre of a pencil*, the vertex of a pencil of lines in a plane. Similarly the vertex of a sheaf of lines is called the centre. *Centre of involution*, a point in a range of points in involution such that the product of its distances from any two corresponding points is constant. *Centre of curvature* of a plane curve at any point, the centre of the osculating circle (q.v.). Similarly the centre of curvature of a surface is the centre of the osculating sphere. *Centre of perspective*, *homology*, *collineation*, the point in which all lines joining pairs of corresponding points in perspective figures are concurrent. In case the figures are congruent the centre of perspective is called the centre of symmetry. (For *centre of similarity*, or *similitude*, see SIMILARITY.) *Centre of mean position* or *mean centre of points on a line*, a point from which the algebraic sum of the distance to the given points is zero. The mathematical notion of centre of mean position corresponds to the mechanical idea of centre of mass and centre of gravity; e.g., the mean centre of the vertices of a triangle, i.e., the centroid, corresponds to the centre of mass of a homogeneous triangular plate.

CENTRE OF BUOYANCY. See BUOYANCY.

CENTRE OF GRAVITY. Owing to gravitation all bodies on the surface of the earth are being acted on by forces drawing them towards the centre of the earth. These forces are all sensibly parallel, owing to the large size of the earth compared with that of most natural objects, and produce what is ordinarily called "weight." The weight of any particle of matter whose mass is m is therefore equal to mg , where

g is the acceleration which the body would have towards the earth if allowed to fall freely. The value of g is proved by experiment to be the same for all kinds and quantities of matter, but to vary from point to point on the earth's surface. Any large body may be considered as made up of parts, all being acted upon by parallel forces, and the resultant of these forces will be the weight of the body and will be a force whose value, position, and direction are given by the ordinary laws for compounding parallel forces. (See MECHANICS.) The point in the body (or in space connected with the body)



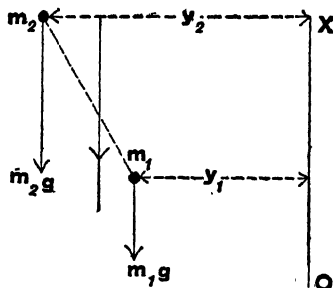
through which this resultant always passes, however the body is turned or placed, is called its "centre of gravity." Thus, if m_1 and m_2 are the masses of two small bodies, which may be called "particles," kept at a distance h apart, their centre of gravity may be calculated as follows: Through any point O in the vertical plane including the particles, draw two straight lines, OX and OY , at right angles and parallel respectively to the vertical lines representing the weights of m_1 and m_2 . Let x_1 and x_2 be the perpendicular distances of m_1 and m_2 from OY ; then, by the law of parallel forces, the resultant of the two forces m_1g and m_2g is a parallel force $(m_1 + m_2)g$ at a distance x from OY , where

$$x = \frac{m_1 g x_1 + m_2 g x_2}{(m_1 + m_2) g}$$

Hence

$$x = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$$

Now, if the two bodies be moved in space, still keeping their distance h apart, OX and OY



moving with them, they can be so placed that OX is now vertical, as in the diagram. Call the distances of m_1 and m_2 from OX y_1 and y_2 .

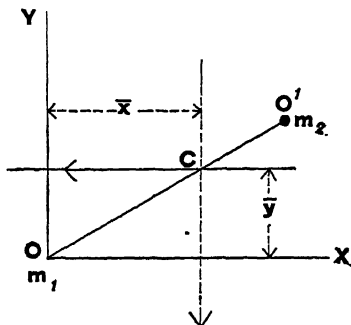
The resultant now is a force $(m_1 + m_2)g$ parallel to OX , and at a distance y such that

$$y = \frac{m_1 g y_1 + m_2 g y_2}{(m_1 + m_2)g}.$$

Hence

$$y = \frac{m_1 y_1 + m_2 y_2}{m_1 + m_2}.$$

It is evident from geometry that in both cases the resultant passes through a point on the



line joining the two particles whose distance from the one of mass m_1 is

$$\frac{m_2}{m_1 + m_2} h.$$

This may be shown by choosing O to coincide with the particle whose mass is m_1 . In that case $x_1 = 0$, $y_1 = 0$, and therefore

$$x = \frac{m_2}{m_1 + m_2} x_2, \quad y = \frac{m_2}{m_1 + m_2} y_2.$$

And so, by similar triangle, these conditions are satisfied by a point C on the line OO_2 such that

$$\frac{OC}{OO_2} = \frac{m_2}{m_1 + m_2}.$$

This point is, therefore, the centre of gravity, being independent of the direction of the line OO_2 . It is evident, further, from these equations for x and y , that the centre of gravity coincides with the "centre of inertia" (q.v.). The centre of gravity of any number of particles may be found in a perfectly similar way. For a uniform straight wire or rod the centre of gravity is its middle point; for a triangular plane figure it is the intersection of the three bisectors of the sides drawn from the opposite vertices; for a homogeneous pyramid it is the point of intersection of the lines drawn from each vertex to the centre of gravity of the opposite face.

If a solid body is suspended by a string fastened to it, or if it is balanced on a point, the line of action of this upward supporting force must pass through the centre of gravity, if the body is at rest. This gives, therefore, a direct method of determining the position of the centre of gravity of a solid by experiment: Suspend it by a string or balance it on a point, draw in the body a vertical line passing through the point of support; suspend the body by fastening the string to a different point, or balance it with another portion of the body resting on the pivot, draw in the body a vertical line through the new

point of support; the intersection of these two lines is the centre of gravity.

CENTRE OF GYRATION. It is proved in mechanics (q.v.) that the moment of inertia of any rigid body about an axis through the centre of inertia may be written Mk^2 , where M is the mass of the body. k is called the "radius of gyration" for that particular axis. A point in the body at a distance k from this axis, and so situated that the line joining it to the centre of inertia is perpendicular to the axis, is called the "centre of gyration." If the whole mass of the body were concentrated into a particle at this point and connected by a cord without mass to the axis, it would have the same energy of rotation as the original body if it had the same angular motion. It is obvious that there will be different radii and centres of gyration for different axes of rotation.

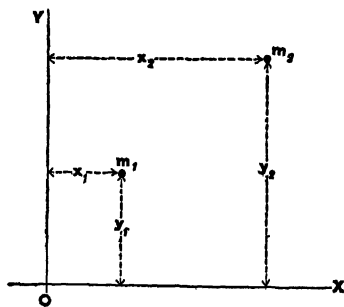
CENTRE OF IMPACT. The calculated mean position of the actual points of impact of a series of shots fired under identical conditions, all shots being referred to a common origin. The accuracy of a gunner is measured by the distance of the centre of impact from the point aimed at. See BALLISTICS; GUNNERY.

CENTRE OF INERTIA (Lat. *inertia*, inactivity, literally unskillfulness). The centre of inertia of two particles whose masses are m_1 and m_2 is defined as follows: Draw in the plane which includes the two particles two lines, OX and OY , at right angles to each other; let the distances of the particles from OX be y_1 and y_2 , and from OY be x_1 and x_2 ; then the centre of inertia is such a point that its distances from OY and OX are given by the equations

$$x = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}.$$

$$y = \frac{m_1 y_1 + m_2 y_2}{m_1 + m_2}.$$

It is evident from these equations that this point coincides with the centre of gravity (q.v.);



and that if the distance between the particles is h , the centre of inertia is upon a line joining the two particles at a distance equal to $\frac{m_2}{m_1 + m_2} h$ from the particle m_1 .

This is at once evident if the line OX is chosen to pass through both particles, and if O is made to coincide with the particle whose mass is m_1 . In this case $y_1 = y_2 = 0$, hence $y = 0$;

$$x_1 = 0, \quad x = h, \quad \text{hence } x = \frac{m_2}{m_1 + m_2} h.$$

In a perfectly similar manner, the position of the centre of inertia of any number of par-

ticles or of a solid body made up of particles may be calculated.

The physical properties of the centre of inertia are most interesting. They are as follows: 1. If a blow or a force is applied to a body in such a direction that the line of action passes through the centre of inertia, the whole body will receive a velocity in the direction of the force; there will be no rotation, and the velocity and acceleration will be exactly what they would be if the same blow or force were applied to a single particle whose mass equals that of the body. 2. If the line of action does not pass through the centre of inertia, there will be rotation exactly as if the centre of inertia were pivoted; but the body will also move as a whole so that the centre of inertia will describe the same path as it would if the line of action of the force had passed through it. These two properties give a simple, self-evident method of locating the centre of inertia of a body by direct experiment: Place it on a smooth table, and by trying different directions determine one such that a blow in this direction produces no rotation, simply translation; draw a line in the body marking this direction; locate another similar line, and the centre of inertia is where these two lines intersect.

Illustrations of these two general properties of the centre of inertia are numerous. If a man falls from a building without striking the wall in his descent, his centre of inertia describes a vertical line, however he twists or turns. If a hammer is thrown obliquely upward in the air, it will revolve rapidly; but one point of the hammer—viz., its centre of inertia—will describe a smooth curve, called a parabola, which a single particle would describe if it were thrown upward in the same manner. When a shell explodes in its flight, the fragments fly off in different directions; but their centre of inertia at any instant is on a parabola, the same that it would have followed if there had been no explosion. See MECHANICS.

CENTRE OF OSCILLATION (Lat. *oscillatio*, a swinging). The period of oscillation of a simple pendulum—i.e., of a minute particle of matter vibrating through a small amplitude at the end of a fine thread which is supposed to be without weight—is given by the formula

$$T = 2\pi\sqrt{\frac{l}{g}},$$

where $\pi = 3.1416$, l is the length of the thread, and g is the acceleration of a falling body due to gravity. Thus, the period varies as the square root of the length of the pendulum. If, however, the vibrating body is a large solid oscillating about a fixed horizontal axis, the period of oscillation is given by the formula

$$T = 2\pi\sqrt{\frac{I}{Mgh}},$$

where I is the moment of inertia around the axis of suspension, M is the mass of the body, and h is the perpendicular distance from the axis of suspension to the centre of gravity of the body.

If any individual particle of the vibrating body were separately connected with the axis of suspension by a fine thread and entirely disconnected from the rest of the body, it would form a simple pendulum; but in general its period would not be that of the body itself. Those

particles nearest the axis of suspension would also vibrate in a shorter time than those farther away. As a rule it is possible, however, to find a series of particles which, vibrating as simple pendulums, would have the same period as that of the body. Their distance from the axis of suspension is evidently given by the condition

$$\frac{l}{g} = \frac{I}{Mgh}$$

or

$$l = \frac{I}{Mh}.$$

If a line can be drawn in the body parallel to the axis of suspension, at the distance l from it, and so that the plane of the two lines includes the centre of gravity, it is called the "axis of oscillation," with reference to the given axis of suspension. It may be shown that if the body be suspended so as to vibrate about the axis of oscillation, the former axis of suspension will be the new axis of oscillation, and the period of vibration is the same in both cases. The intersection of the axis of oscillation by a plane passing through the centre of gravity and perpendicular to the axis is called the "centre of oscillation."

CENTRE OF PERCUSSION (Lat. *percussio*, a beating, striking). If a rigid body is suspended so that it can turn freely about a fixed axis—e.g., a door—a "line of percussion" is such a line that a blow struck the body in that direction produces no reaction of any kind on the axis. In general, when a blow is struck the body in any chance direction, the axis experiences both a twist and a sidewise push; and, if the axis is held in fixed bearings, they must be strong enough to resist these. The point where the line of percussion intersects the plane which passes through the axis of suspension and the centre of inertia is called the "centre of percussion." This point may be proved to lie on the "axis of oscillation," with reference to the given axis of suspension. If the body is hanging freely from a point, so that the centre of gravity lies vertically below it, the centre of percussion coincides with the centre of oscillation.

CENTRE OF PRESSURE. The centre of pressure of any surface immersed in a fluid is the point in which the resultant of the pressures of the fluid on the several points meets the surface. The pressure of a fluid at a point is the "force per unit area" at that point, or the limiting value of the ratio of the force acting over a surface to the area of the surface, as the surface is taken smaller and smaller. This pressure is due to two things—the weight of the fluid and the reaction of the walls of the vessel which contains the fluid. (See HYDROSTATICS.) The pressure due to a gas is generally uniform over a surface, unless it is very large, and so the centre of pressure is the centre of gravity of the surface; but in liquids it is different. When the bottom of a vessel containing a liquid, or when a plane immersed in a liquid is horizontal, the pressures on all the points of it are the same; obviously they form a system of equal parallel forces, whose resultant will pass through the centre of gravity of the bottom or plane. But when the plane is inclined at an angle to the surface of the liquid, the pressure is not the same at all points, being greater at the lower than at the upper points. The resultant of the forces, then, will not pass through the

centre of gravity of the surface, but through a point below it. This point is the centre of pressure. In the case of a vessel with a rectangle for one side, the centre of pressure is at the distance of one-third of the height from the bottom. In the general case it must be found by calculation involving the calculus.

CENTRE PINTLE CARRIAGE. A gun carriage in which the chassis, or way on which the upper part of a seacoast gun moves, is attached to the pintle of the platform at its middle, and revolves around it through the entire circumference of the circle. The traverse circles are consequently continuous. By this arrangement an all-round horizontal field of fire is secured. See ORDNANCE; COAST ARTILLERY.

CENTRIFUGAL (Neo-Lat. *centrifugus*, from Lat. *centrum*, centre + *fugere*, to flee). A machine employed in the process of clarification and filtration. It consists of a circular vessel so constructed as to be capable of being made to revolve at a very high rate of speed. When the muddy liquid is placed in the vessel and the whole caused to revolve, it is found that the particles of dust, mud, or other matter fly to the circumference, leaving the liquid in the centre practically clear. In many centrifugal machines there is in the centre a cylindrical box or basket of fine wire gauze or perforated metal fixed on a vertical shaft. Upon revolution the clear liquid is thrown to the circumference and through the screen, leaving the material within the basket almost dry. By suitable arrangements the clear liquid can be drawn off. A machine of this kind is used in sugar refining, and on a smaller scale in chemical laboratories, while centrifugal separators are employed for separating cream from the skim milk.

CENTRIFUGAL and CENTRIPETAL (in botany). See INFLORESCENCE.

CENTRIFUGAL FORCE. See CENTRAL FORCES; MECHANICS (section on *Dynamics*).

CENTRING. The temporary framework either of timber or a combination of timber and iron, or of steel, upon which any arched structure is to be built whether of masonry or of steel.

A centre consists of a series of parallel templates called *ribs*, usually placed 5 to 6 feet apart, and so constructed as to have their upper edges conform in outline to the *soffit* or internal concave face of the arch. Transverse planks called *laggings* are fastened to these and upon them the *voussoirs* or arch stones directly rest.

In building the arch the centring should always be loaded symmetrically, and hence the work proceeds simultaneously from the two sides towards the middle. The stresses produced by the laying of the masonry are longitudinal rather than transverse, since under these conditions greater efficiency is secured from the timbering.

Transverse stresses will generally break the members under a very much smaller load than may be carried by the same members under a compressive thrust.

The centres should be allowed to remain in position as long as possible, even after the completion of the arch and even after the backing has been built, so that the mortar may have time to set completely. Where the arch forms one of several with intermediate piers, no centre should be removed or *struck* until it is symmetrically located with regard to two other and adjacent arches; as otherwise, unless the piers are abut-

ment piers, the thrust from one side will not be counteracted by a similar thrust from the other.

A centre should be absolutely stiff and settle as little as possible, since it is upon this templet that the structure is built. Generally the entire centre may be lowered simultaneously by removing the *wedges* in the *striking plates*, which latter perform the function of keeping the *lagging* in position close to the arch stones. The object of removing the entire centre at once is to avoid cross stresses in the arch itself.

In masonry arches of long span, where centres have reached their greatest development, three methods are used:

1. Direct supports from intermediate points.
2. Inclined struts in pairs.
3. Trussed girders.

The first is used wherever practicable, and the second and third when the supports in the first method cannot be brought close enough together.

In arches of great span, such as that of Waterloo Bridge, London, or the Cabin John Bridge, Washington, a longitudinal pulling strain is almost inevitable, as a beam of great length would bend to some extent under a thrusting strain. In such cases great skill is demanded in the designing and construction of the joints. As an arch is built from the piers towards the keystone, the weight upon the haunches during construction tends to push the crown upward, and therefore the problem of designing a framed centring involves the resistance of this tendency, as well as the supporting of the weight of the materials.

CENTRIPETAL FORCE. See CENTRAL FORCES.

CENTROSOME (from Gk. *κέντρον*, *kenitron*, centre + *σῶμα*, *sōma*, body). One of the two polar centres of the spindle, or "dynamic centres" from which the "archoplasmic" threads radiate and towards which the halves of the split chromatin elements are drawn at the time of cell division. The centrosome seems to be less frequently present in the plant than in the animal cell. See CELL; EMBRYOLOGY.

CENTUM CELLÆ. See CIVITAVECCHIA.

CENTUM VIRI (Lat. nom. pl., board of 100 men, from *centum*, hundred + *vir*, man). In ancient Rome, a body of jurymen, three from each tribe, in charge of civil cases. Under the Empire the number was increased to 180, presided over by the *Decemviri*, and the sessions were held in the Basilica Julia (q.v.). Here the younger Pliny pleaded, and the Emperor Trajan sometimes listened to the arguments.

CENTURION (Lat. *centurio*, from *centuria*, company of 100, from *centum*, hundred). In the Roman army, the captain of a *centuria* or company. There were 60 centurions in each legion, a junior and a senior for each of the 30 *maniples*; the senior of the first *maniple* of the first *cohort* was the chief centurion, or *primipilus*, of the legion, and often had the real command of the entire body.

CENTURIOPE, chén'tōō-rē'pā. A city in the Province of Catania, Sicily, 28 miles northwest of Catania, formerly called Centorbi (Map: Italy, J 10). After removing the inhabitants to his new town of Agosta (q.v.), in 1233, Emperor Frederick II destroyed Centuripe, but it was rebuilt in 1548. Pop., 1901, 11,311; 1911, 13,111.

CENTURY (Lat. *centuria*, properly, a Hundred, a company numbering 100, then com-

pany in general). A division of the Roman people. See COMITIA; SERVIUS TULLIUS.

CENTURY PLANT. See AGAVE.

CEORL, *kéorl* or *chéril* (AS., man, husband, Ger. *Kerl*, man, possibly ultimately connected with Skt. *jāra*, bridegroom, paramour), or **CHURL**. In the Anglo-Saxon social order, a common freeman, as distinguished from an eorl (earl), who was a privileged freeman. As the term *earl* did not originally imply a patent of nobility, nor even lordship or dominion, but only superior birth and social position, so the title *ceorl* implied no degradation or inferior status, but, on the contrary, marked its possessor off from the lower classes—the *laet*, or unfree man, and the *theow*, or slave. The *ceorl* was capable of owning land, and had a share in the common plowland and meadowland of his community. The *ceorls* were the citizens of the *mark* (q.v.), or *hundred* (q.v.), composing the *moot* (q.v.), or general assembly of the people, and administering the local justice and government. See VILLENAGE, and consult the authorities there referred to; also Freeman, *History of the Norman Conquest of England*, vol. 1 (2d ed., Oxford, Eng., 1870-76).

CE'OS. See ZEA.

CEPH'AL'IS. See IPECACUANHA.

CEPH'ALAL'GIA. See HEADACHE.

CEPH'ALAS'PIS (Neo-Lat., from Gk. *κεφαλή*, *kephalē*, head + *ἀσπίς*, *aspis*, shield). A genus of primitive armored fossil fishes of the order Osteostraci and class Agnatha found in the brackish and fresh-water deposits of the British and North American Devonian formations. The body was elongated, triangular in section, and covered throughout with armor. The armor of the head region consists of a single heavy principal plate on the dorsal surface, which, when viewed from above, has the form of a horseshoe or the carapace of a king crab (*Limulus*). A ventral plate is opposed to the dorsal plate and there are a few small accessory plates. There are no jaws, for the mouth was of the same form as that of the modern lamprey, in which animal it is a sucking organ. Indeed, the lampreys are believed to be degenerate descendants from early heavily armored types like *Cephalaspis* and its associates among the Osteodermi. The skeleton of *Cephalaspis* must have been wholly cartilaginous, for no traces of it have been preserved. The body was covered by bony scalelike rings, it had a single dorsal fin, and the tail fin was heterocercal as in the modern sharks. The best examples of *Cephalaspis* have been obtained in the Old Red Sandstone of Scotland and England. The American examples are of less satisfactory preservation and are found in the Devonian sandstones of the provinces of New Brunswick and Quebec, Canada. For illustration, see OSTRACODERMI.

CEPHAL'IC INDEX. See INDEX, CEPHALIC, ETC.

CEPH'ALIZA'TION (from Gk. *κεφαλή*, *kephalē*, head). The phenomena of progressive concentration and enlargement of the parts of the body belonging to the head; a phenomenon characteristic of segmented animals. Cephalization is only a special case of the law of division of labor. In the earlier metameric animals the head is only slightly different externally from the other segments, and consists of but 2 or 3 metameres. Already, however, the principal sense organs are located in the head, and the

central nervous system is enlarged there to form a brain. In the Arthropoda and the vertebrates the number of metameres in the head is increased, there being 6 head metameres in the crayfish, probably 6 in insects, and from 9 to 13 in vertebrates. The head now takes on the principal sensory and psychical functions, which are abandoned by the rest of the body. The sense organs become more and more concentrated at the head and they become larger; the nerve centres at the head become relatively more important, and so the brain increases in size, while the interrelation of parts becomes more intimate, so that the head not only becomes larger, but also more of a unit, and the brain more efficient as a controlling factor.

CEPHALLENIA. See CEPHALONIA.

CEPHALOCHORDA, *séf'al-ô-kôr'da* (Neo-Lat. nom. pl., from Gk. *κεφαλή*, *kephalē*, head + *χορδή*, *chordē*, cord). A small class of chordate animals, including the lancelet. These are usually regarded as offshoots of the primary vertebrate type, although some maintain that they are pioneer or ancestral types themselves and foreshadow fishes. See AMPHIOXUS.

CEPH'ALODIS'CUS. An extraordinary deep-sea animal, regarded as allied to *Balanoglossus* (q.v.), and classed, with a related genus, *Rhabdopleura*, among the *Adelochorda*, as the lowest of the phylum Chordata. They were formerly regarded as polyzoons, but resemble *Balanoglossus* in structure, having a proboscis, a collar and collar cavity, and a trunk containing a structure resembling a notochord. "Cephalodiscus has an investment in the form of a branching gelatinous structure, which is beset with numerous short, filiform processes, and contains a number of cavities occupied by zooids. The latter are not in organic continuity, so that, though inclosed in a common investment, they do not form a colony in the sense in which the word is used of the Polyzoa or hydroid polyps. . . . They multiply by buds, but these become detached before they are mature. . . . *Rhabdopleura* occurs in colonies of zooids organically connected together, and inclosed in, though not in organic continuity with, a system of branching membranous tubes." Consult Parker and Haswell, *Text-Book of Zoology* (London and New York, 1910).

CEPHAL'EDIDIUM. See CEFALU.

CEPH'ALO'NIA, or **KEPH'ALLE'NIA** (Gk. *Κεφαλληνία*, from *κεφαλή*, *kephalē*, head + *ὄνος*, *onos*, donkey). The largest of the Ionian Islands (q.v.), situated off the coast of Greece, between lat. 38° and 38° 30' N. and long. 20° 21' and 20° 49' E. (Map: Greece, B 3). Its greatest length is about 32 miles, and its total area 266 square miles. The surface is mountainous, Monte Negro attaining the height of 5313 feet. The soil is for the most part thin; fresh water is scarce and the rainfall slight. The climate is warm and dry, but agreeable. Earthquakes are not infrequent. The inhabitants are industrious and enterprising, and have planted vineyards wherever the grape will grow. There is little available land for the cultivation of grain, but the output of fruit is considerable. The chief products are olives, currants, and other southern fruits and vegetables, cotton, wine, and olive oil. The language spoken is a Greek dialect. The chief towns are Argostoli (q.v.), the capital, and Lixuri, on the Bay of Livada, on the southwest coast.

Cephalonia is called, by Homer, Same or

Samos. Later the island appears under the name of Cephallenia. It successively fell into the hands of the Athenians, Romans, Byzantines, Normans, and Venetians, from the last of whom it was repeatedly wrested by the Turks. On the fall of the Venetian Republic, in 1797, it was seized by the French. In 1809 it came into the possession of Great Britain. It was ceded to Greece in 1864. With Ithaca and some neighboring islets Cephalonia now forms a nome of Greece, with an area of about 315 square miles and a population (1907) of 71,235.

CEPHALOPODA (Neo-Lat. nom. pl., from Gk. *κεφαλή*, *kephalē*, head + *πούς*, *pous*, foot). The highest and most specialized class of Mollusca, characterized by the presence of a circlet of fleshy arms surrounding the mouth on the front of the head. These arms, also called "tentacles" and "feet," are modifications of the "foot" which, as the muscular organ of locomotion of the Gastropoda and the Pelecypoda, occupies a ventral position on the body of the animal in those classes. In the Cephalopoda the foot has moved forward and become divided into two sections. The anterior section forms the circlet of arms that serve both as accessory mouth parts, to catch and hold the prey, and as organs of creeping locomotion. The posterior section has become developed into part of a most efficient hydrostatic organ of propulsion, called the "hyponome" or "siphon." The body of the cephalopod is essentially a bag formed of the "mantle," which entirely incloses the visceral organs, and which is open only at the end to which the head is attached. In some genera this bag is almost spherical, and creeping locomotion is accomplished chiefly by the appendages of the head; in others, the body is elongated, and furnished with two finlike expansions on the sides, and the animal propels itself through the water by means of the hydrostatic organ, the hyponome. The ordinary position of the cephalopod in water is quite different from that of any other mollusk. A chiton, a snail, or a clam moves with the foot down, the mouth at the anterior end, and the visceral hump uppermost on the dorsal surface. A cephalopod when creeping has a very similar position, except that the mouth is ventral. In swimming, however, cephalopods have the mouth at the anterior end, and what was the anterior side is now the dorsal side of the animal. Thus the cephalopod, in taking to an active swimming life, has tipped backward through an angle of 90°. Cephalopods are able to swim forward or backward, often with great rapidity, the most important means of locomotion being the hyponome, near the underside of the head. The mantle is attached to the neck only on the dorsal side; elsewhere there is free communication between the mantle cavity and the outside. When the mantle relaxes, water fills the cavity; when it contracts, it closes tight about the neck; there is no exit for the contained water save through the hyponome, and, as contraction takes place suddenly and forcibly, a jet of water is expelled from the hyponome, causing the animal to dart backward through the water.

The head of a cephalopod is roundish, more distinct from the rest of the body than it is in other mollusks, and is generally furnished with two large and prominent eyes that are very similar in structure to those of vertebrate animals. The nervous system is very well developed and is more centralized than in other mollusks.

The ganglia are well concentrated in what may be called the brain, which lies above and around the oesophagus and is more or less wholly included within the cartilage of the head. From this brain nerves go to the various organs and parts of the body. The senses of hearing and smell are regarded as weak, but that of taste seems to be strong. The mouth opens in the midst of the circlet of arms. It is furnished with a strong, horny beak of two jaws that move vertically like those of a parrot, but the upper jaw is the shorter of the two. In addition to the jaws, there is a lingual ribbon covered with minute teeth, like that of the odontophore of the gastropods. The digestive apparatus is very complicated. The gullet swells out into a crop, and there is a gizzard as muscular as that of a bird. The intestine, after a few convolutions, terminates in the cavity which contains the gills at the base of the hyponome, by which the water is ejected from the mantle cavity after having supplied air for respiration. There are two gills in most living cephalopods, one on each side, lying close to the body wall; the only exceptions to this rule are in the three species of nautilus which have four gills, a pair on each side. Each gill consists of many membranous plates fixed to two sides of a stalk. The heart in the Tetrabranchiata consists of a single ventricle only; but there are four auricles, one for each gill; the Dibranchiata have two auricles, one for each gill. In the latter group, moreover, are found two contractile reservoirs (branchial or respiratory hearts), one for each gill, by which the blood is pumped into these organs.

The arms or feet are very numerous in the Tetrabranchiata, and are not provided with suckers, but are hollow and furnished with long, retractile tentacles. In the Dibranchiata the arms are either 8 or 10 in number, are furnished with suckers (acetabula), and in the 10-armed genera two of the arms are much longer than the others and differ from them in form. The suckers are muscular disks, with cartilaginous rims, capable of exact application to any object, with central cavities the bottoms of which can be retracted at will to form a vacuum, and thus render the adhesion of the sucker close and firm after the manner of a cupping glass. The poulpe or octopus has each of its eight flexible arms crowded with 120 pairs of such suckers, and as animals of this kind, with arms several feet long, exist commonly in the tropics, they are considered dangerous neighbors. Still more formidable, however, are the hook squids of the south seas, the two long arms of which have suckers furnished in the centres with hooks that enter the flesh of any creature upon which the squid may lay hold.

The sexes are distinct in all cephalopods. In most cases the male is smaller than the female. He differs, moreover, in the asymmetry of his arms, one of which is more or less modified to form a copulatory organ. In two or three genera this modified arm breaks off from the body during copulation, and finds its way into the mantle cavity of the female, where it empties itself of the male sperm cells which it carries. The first zoölogist who found such an arm in the mantle cavity of a female argonaut mistook it for a parasitic worm and called it "hectocotylus" ('hundred cups'), from the numerous suckers which it bears. When its true nature was discovered, it was called a "hectocotylized"

arm, and the term is still used in that connection. The eggs have a horny covering, and after their extrusion from the parent they become agglutinated into masses of various forms. The young from the first very much resemble the mature animals, except in size.

All dibranchiates are provided with a peculiar organ of defense, called an "ink bag," which is absent in the tetrabranchiates. This ink bag is filled with a peculiar secretion, capable of being expelled at will through the hyponome to darken the surrounding water and thus facilitate the escape of the cephalopod. (See *SEPIA*.) The tetrabranchiate cephalopods have a chambered shell which is described in further detail below. (See also *NAUTILUS*.) The dibranchiates have no true external shells—the shell of the female argonaut being scarcely an exception—but they have an internal shell, homologous to the external tetrabranchiate shell, known as cuttlefish bone, etc., sometimes merely rudimentary, included between the folds of the mantle and apparently serving to support the organs and to give rigidity to the body while swimming.

The cephalopods are all very voracious; they are carnivorous, feeding on fish, mollusks, crustaceans, etc. Even a powerful crab is not safe from the attack of a dibranchiate cephalopod little bigger than itself; the arms of the octopus, so abundantly provided with suckers, seize the crab, trammel every movement, and the parrot-like beak is strong enough to break the hard shell. Cephalopods are all marine, and they are found in the temperate and tropical parts of all seas. *Nautilus*, the single modern genus of the tetrabranchiates, with three species, lives in the Indian and South Pacific oceans, where it creeps on the bottom, near the shore, in comparatively shallow water. The dibranchiates are quite abundantly represented at the present time. The members of the two living orders, Sepioidea and Octopoda, have rather different habits and correspondingly different habitats. The Octopoda, with round, saclike bodies and eight arms, are essentially creepers on the bottom, like the poulpe or octopus. They live in shallow water along the shore, hiding in cavities during the day and creeping about over the rocks of the bottom by night. They are also capable, when they find themselves in large bodies of water, of swimming rapidly by means of the hyponome. They are often handsomely colored creatures, but they are generally repulsive objects.

The Decapoda have long, slender bodies and 10 arms, of which two are much longer than the rest. They are found in all seas, often in deep water. Many of them congregate in hordes in the open sea, swimming about with great rapidity. Unlike the octopods, they seldom creep on the bottom, the hyponome being the principal organ of locomotion. Their motions are extremely graceful, and they are often beautifully colored. In size the living cephalopods range from a few inches in length (*Sepiola*) to many feet. The largest invertebrate is undoubtedly a giant squid (*Architeuthis*) of the Newfoundland banks, that often attains a length over all of 50 feet, of which the body has a length of 9 feet, with a thickness of 6 feet, and the arms the enormous length of 40 feet. This creature is indeed the "devilfish" about which so many thrilling stories have been told.

Fossil Cephalopoda. The shells of cephalopods are more or less common in the rocks of all ages, from the top of the Cambrian to the top

of the Mesozoic, while in the Tertiary deposits they are less frequently met with. In some formations they are so abundant as to constitute the greater part of the mass. They are objects of much interest to the geologist, in that they furnish excellent "index fossils" for the identification of the formations, as in the case of the Triassic and Jurassic rocks of Europe, which are subdivided into a great number of zones, according to the particular species of Ammonoidea that they contain. To the paleontologist they are also of very great interest, because, better than any other class of animals, they afford opportunity for studying the mode of evolution of races of animals and illustrations of the various laws of bioplastology, such as Agassiz's law of recapitulation or palingenesis, the inheritance of acquired characters, the laws of acceleration, etc. For some of the interesting and important results derived from the study of the fossil shells of tetrabranchiate cephalopods, the reader should consult the papers of Hyatt, Buckman, Foord, and others, which are cited at the end of this article. The philosophic bearings of the study of cephalopods can be dwelt upon only lightly in this article, as lack of space prevents a proper array of facts necessary for their elucidation.

The cephalopods were very important members of the fauna that inhabited the early seas of our globe and were then far more abundant than they are now. The tetrabranchiates are represented by at least 7500 fossil species, of which number 5000 are members of the totally extinct order Ammonoidea, which began in the Silurian and culminated in the Cretaceous time. The remaining 2500 are Nautiloidea, which appeared in the late Cambrian time, and which have continued to the present day, though they enjoyed their climax during the early Paleozoic ages of the Ordovician and Silurian. The dibranchiates are far less important as fossils. They appeared in the early Mesozoic, where they were represented by numerous Belemnitoidea, which declined with the close of Cretaceous time, and they have continued to the present era, when they are represented by some 200 known species of the Sepioidea and Octopoda.

The study of fossil cephalopods is based almost entirely on the shell characters, for traces of the soft parts are only seldom found. The fossil ink bags, jaws, and hooks of certain dibranchiates are rare exceptions. (See *SQUID*; *SEPIA*.) As already indicated, cephalopods are divided, according to their gill structure, into two subclasses—Tetrabranchiata and Dibranchiata—which groups differ also in respect of their shell characters. The shell of the tetrabranch is built on the plan of that of the nautilus, though, instead of being closely coiled, it may be loosely coiled (*Gyroceras*), curved (*Cyrtoceras*), or straight (*Orthoceras*). In the dibranchiates the shell is internal and has the form of a pen or cuttlefish bone; or, in those early Mesozoic genera that show close relations to the tetrabranchs from which they have been recently evolved, the shape of a solid, limy, cigar-formed guard, into the larger end of which is inserted a chambered conical shell that resembles *Orthoceras*. (See *BELEMNITES*.) One modern dibranchiate (*Spirula*) has an internal shell remarkably like that of certain loosely coiled nautiloids of the Devonian.

The type of tetrabranchiate shell is found in the nautilus. Here the shell is coiled so closely

that the outer whorls to a considerable extent envelop or clasp the inner turns. In section, a nautilus shell is seen to be essentially a coiled, elongated cone with quite regular transverse walls, or "septa," dividing the internal cavity into a number of chambers, or "camerae," of which the largest is the outermost or living chamber occupied by the animal. Extending from the living chamber through all the posterior chambers to the apex of the shell, and piercing each septum, is a slender tube, the "siphuncle," which occupies a position near the centre of the cone, and which serves to maintain communication between the living chamber and the posterior regions of the shell. Each of the septa represents a stage in the development of the individual, so that in each nautilus shell we have all the stages through which the shell has passed from the embryonic period, represented by the minute apex in the centre of the coil, to the adult or senile stage, represented by the living chamber on the outside of the coil. It will be readily recognized that this condition is of utmost value for the study of the evolution of the group, and that it is scarcely equaled in any other class of animals. For this reason the cephalopods have furnished greater contributions to the knowledge of bioplastology than have any other organisms.

At the apex of the nautilus shell is seen a scar that marks the place of attachment of a deciduous embryonic shell, or "protoconch," which probably fell off as soon as the true shell began to develop. The developmental stages of the living nautilus are less well known than are those of most of its extinct ancestors, but the existence of the deciduous embryonic sac is inferred from the presence of a thin-walled calcareous bulb on the apices of several Paleozoic relatives of *Nautilus*, and also in its descendants, the goniatitoids and ammonoids. The septa are united to the side walls of the cone along lines that show prominently in the fossil forms, which are nearly always filled solid with infiltrated calcite. These are the suture lines, which furnish characters of the greatest importance in determining the relationships, especially of the species of Ammonoidea. The lines of growth on the outside of the shell indicate the form of the margin of the aperture and vary with the habits of the animal. In living *Nautilus* the hyponome is near the outer ventral curve of the aperture of the shell, and there is on that side an emargination or sinus known as the "hyponomic sinus." The size of this sinus corresponds to the swimming activity of the animal; the larger the sinus, the more active the swimmer, and vice versa. The aperture of *Nautilus* is open wide, and the animal is considered to be a good crawler. In some of the Paleozoic nautiloids the aperture is much restricted, and the ability to crawl must have been greatly diminished, while the swimming power was increased, as evidenced by the somewhat larger size of the hyponomic sinus.

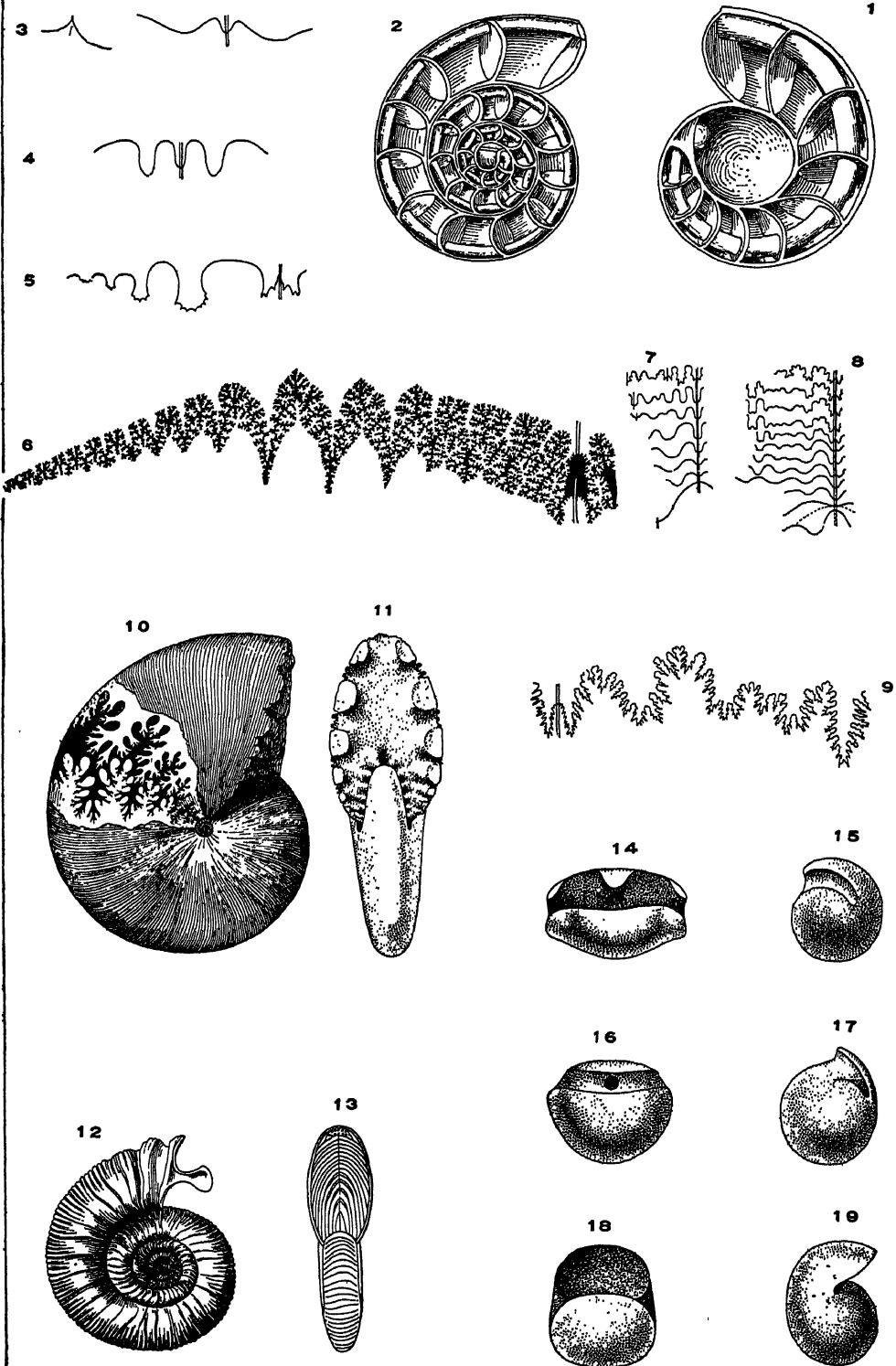
The degree of curvature of the shell is important. The earliest relatives of *Nautilus* were straight shells that had all the morphic characters of *Nautilus* itself; soon curved and coiled forms appeared, and the coiled forms were in all cases evolved from straight forms through intermediate curved forms. Accompanying the changes in curvature were also changes in the form and position of the siphuncle. (See ORTHOCERAS; CYRTOCERAS; NAUTILUS.) The coiled

forms, such as *Nautilus*, etc., appeared in considerable numbers at a very early age in the Lower Ordovician period, and certain nautilitic genera continued, often in abundance, in the late Paleozoic and Mesozoic periods, to the present time, *Nautilus* itself maintaining its early form without change. The straight cones (*Orthoceras* and its allies) began at an even earlier age in the Upper Cambrian. They reached a great expansion during the Ordovician and Silurian periods, when they gave rise to many peculiar genera, such as *Onoceras*, *Piloceras*, *Asioceras*, *Sphyradoceras*, *Endoceras*, and *Lituites*; some of these, as *Endoceras*, attained a size of over 10 feet, surpassing in this respect all other shell-bearing Paleozoic invertebrates. They declined through the Devonian and Carboniferous periods, and became extinct in the Triassic.

Various stocks of straight shells, in assuming the habits of both crawlers and swimmers, assumed curved forms and gave rise to such genera as *Cyrtoceras*, *Phragmoceras*, *Gomphoceras*, etc., at various periods in the history of each stock. The shells of some of these curved forms, through adaptation to a crawling life on the ocean bottom, became more closely coiled, their organization changed, and a new order (the Ammonoidea) arose, which outnumbered its ancestors the Nautiloidea, enjoyed a pyrotechnic expansion during the early Mesozoic period, soon began to decline, and eventually, at the end of the Cretaceous, became suddenly totally extinct.

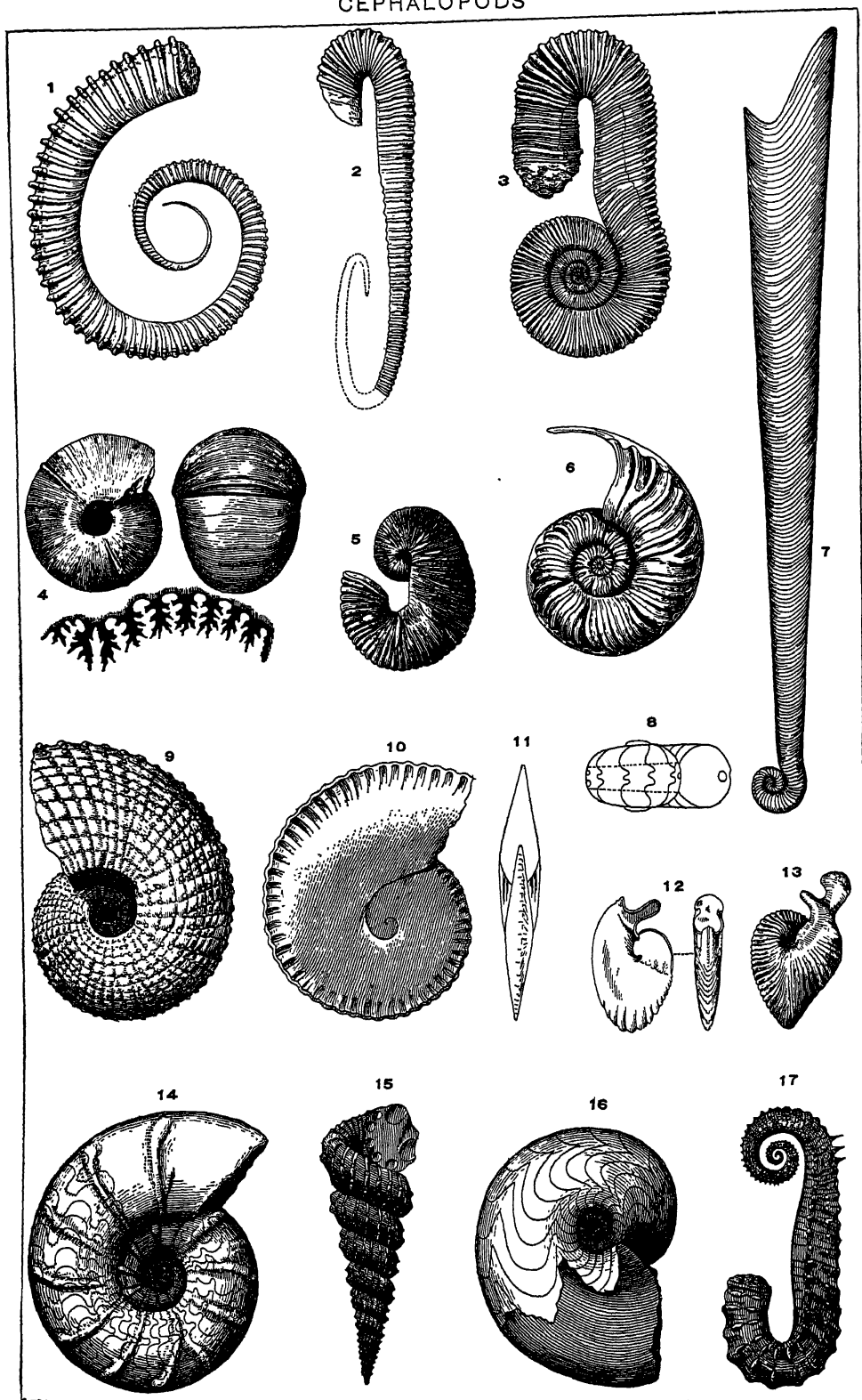
The ammonoidean shells differ from the nautiloidean in that they always have a calcareous protoconch of saclike form attached to the apex of the cone. On this protoconch is formed the early ammonoid shell with the septa of simple curves like those of the nautiloids. After a few chambers have been formed the septa become crimped or wrinkled, and the sutures wavy or with prominent curves. In the earliest Devonian members of the group, the goniatitoids, these simply curved or undulating sutures are the rule in adult shells. Later members of the Mesozoic age show sutures of great complexity. It is in these later forms—the ceratitoids and ammonitoids—that the illustrations of Agassiz's law of recapitulation are observed. If an adult ammonite shell, such as *Tropites*, be broken and the fragments be arranged in order from apex to living chamber, the sutures will be found to increase in complexity from simple curves to complex wavy lines. The simple suture will recall that of the Silurian nautilus, the wavy suture that of the Devonian goniatite, and the complex suture is that of the normal ammonoid. Together with the change in the form of the suture lines, there is a change in the position of the siphuncle. This is illustrated in the sections of *Paltopterooceras* and *Parkinsonia* (Cephalopoda, Plate I, Figs. 1 and 2), where in the first chamber the siphuncle is central, as in *Nautilus*, and in successive chambers approaches nearer to the outer ventral wall of the shell, with which it finally unites. We have here instances where the shell passes in its development from embryo to adult through stages that recall the forms of its past ancestors. Some of the more complex types of ammonitoid sutures are shown in Figs. 6, 9, and 10 of Plate I, where also the illustrations of *Phylloceras* (Figs. 10 and 11) show the relations between the crimping of the septum and the complexity of the suture line.

CEPHALOPODS



For names and description, see text.

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The embryos of ammonoids (Plate I, Figs. 14-19) exhibit three types, distinguished as asellate, latisellate, and angustisellate, which terms refer to the form of the first suture line. As a rule, the asellate protoconchs are the more primitive, as in the early goniatitoids. The later goniatitoids have latisellate embryos. The angustisellate embryos appear in the Triassic genera of ceratitoids, and nearly all of the ammonitoids of the Jurassic and Cretaceous have angustisellate protoconchs. Many ammonoids are known to have possessed opercular plates that served to close the aperture of the shell after the retreat of the animal, as shown in the illustration of *Oppelia* (Plate I, Fig. 13). This organ is known as the anptychus when single, and aptychus when double, and examples of it were in early days supposed to be the carapaces of phyllopod crustaceans.

In form, the ammonoids vary from globular shells (*Cyclolobus*, Plate II, Fig. 4) to flattened discoids (*Pinacoceras*, Plate II, Figs. 10 and 11), and their surfaces are variously ornamented, from smooth *Gephyroceras* (Plate II, Fig. 16), costate *Dipoloceras* (Plate II, Fig. 6), to nodose *Trachyceras* (Plate II, Fig. 9), and in the phylogerontic (senile) stages of some races short spines are developed (*Ancylloceras*, Plate II, Fig. 17). The normal ammonoid shell is a flat, closely wound coil, but the latest members of several races in the Cretaceous rocks have the shell uncoiled or straight in the adult stages, though closely coiled in the early stages of their growth. In some the uncoiling begins only in old age (*Scaphites*, Plate II, Fig. 5, and *Macroscaphites*, Plate II, Fig. 3); in others it is accelerated and appears at relatively earlier periods in the development, as in *Baculites* (Plate II, Fig. 7), *Spiroceras* (Plate II, Fig. 1), *Hamites* (Plate II, Fig. 2), and *Ancylloceras* (Plate II, Fig. 17). The uncoiling sometimes produces a turreted shell, as in *Turritiles* (Plate II, Fig. 15). These uncoiled shells of the Cretaceous rocks are degenerate descendants from earlier normal Cretaceous or Jurassic ancestors, as can be demonstrated by the forms of their sutures. The degeneracy is exhibited also in the form of the sutures, which have become more simple, and in the shape of the cone, which has lost its flattened section due to the closely coiled condition, and assumed the rounded, cylindrical section of its earliest ancestors of the Paleozoic, though it retains the "impressed zone" to serve as evidence of its relationship. For notes on the fossil forms of dibranchiates, see articles referred to at end of the bibliography.

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Jurassic Time," in *Quarterly Journal of the Geological Society*, vol. liv (London, 1898); Foord, *Catalogue of the Fossil Cephalopoda in the British Museum of Natural History*, parts i, ii, iii (London, 1888-97); Hyatt, "Genera of Fossil Cephalopods," in *Proceedings of the Boston Society of Natural History*, vol. xxii (Boston, 1884); Hyatt, "The Genesis of the Arietida," *Smithsonian Miscellaneous Contributions*, No. 673 (Washington, 1889); Hyatt, "The Phylogeny of an Acquired Characteristic," *Proceedings American Philosophical Society*, vol. xxxii, No. 134 (Philadelphia, 1894); Smith, "The Carboniferous Ammonoids of America," *United States Geological Survey Monograph*, vol. xlii (Washington, 1903); Hyatt and Smith, "The Triassic Cephalopod Genera of America," *United States Geological Survey Professional Paper*, No. 40 (Washington, 1905). For fuller lists of titles, see the bibliographies in Zittel-Eastman, *Textbook of Paleontology* (London and New York, 1900), where the most important works cited are those of Barrande, Clarke, Dicner, Gümbel, Hall, Von Hauer, Haug, Holm, Hyatt, Mojsisovics, Neumayr, Nikitin, Noetling, D'Orbigny, Quenstedt, Smith, Waagen. See also AMMONITES; AMMONOIDEA; BELEMNITES; CERATITES; CUTTLEFISH; GONIAITITES; NAUTILUS; OCTOPUS; ORTHOCERAS; POULPE; SEPIA; SPIRULA; SQUID.

CEPHALUS, sēf'ā-lūs. In Athenian story, a grandson of Æolus, and the husband of Procris, whom he inadvertently killed while she was spying upon him in suspicion of his fidelity. After undergoing punishment for his unintentional crime, he settled in an island which was called, after him, Cephallenia.

CEPHEUS, sēf'ūs or sēf'ē-ūs (Lat., from Gk. Κηφείρ, *Kēpheus*, in Greek mythology a king of Ethiopia who was husband of Cassiope, father of Andromeda, and father-in-law of Perseus). A northern constellation situated between Cassiopeia and Draco. Its principal star, Alderamin, is of the third magnitude.

CEPHISODOTUS (Lat., from Gk. Κηφισόδοτος, *Kēphisodotos*). The name of two Greek sculptors, who worked during the fourth century B.C. The younger was the son of the famous Praxiteles (q.v.), and of his works only scanty mention has been preserved. He and his brother Timarchos made a statue of Menander (q.v.), which was set up in the theatre at Athens; its base has been found bearing the signature of the artists. The elder Cephisodotus seems to have been the elder brother, or possibly the father, of Praxiteles, and his works mark the transition from the art of the fifth century to that of the fourth. His group of Irene (Peace) and the infant Plutus (Wealth) is probably reproduced in the so-called Leucothea in Munich; it was set up in Athens after the battle of Naxos in 376 B.C., and probably in celebration of the peace of 371 B.C. The group of Zeus, Artemis, and Megalopolis in the city of Megalopolis was certainly erected after 370 B.C., but the remains of the building seem to point to a much later date, and it is probable that the artist was the younger Cephisodotus. E. A. Gardner, *A Handbook of Greek Sculpture*, pp. 352-354 (London, 1911), holds that there was but one Cephisodotus, and leaves his relationship to Praxiteles undetermined.

CEPHISSUS (Lat., from Gk. Κηφισός, *Kēphissos*). One of the two principal rivers of Attica, flowing into the Saronic Gulf between

Athens and the Piræus west of the Acropolis. It has a constant supply of water from springs on the side of Mount Parnes and Mount Pentelicus. The greater part of its water, however, is diverted into artificial channels for purposes of irrigation, and the exact course of the ancient bed can no longer be ascertained. The principal river of western Boeotia has the same name.

CERACCHI, chă-ră'kă, GIUSEPPE (c.1751-1802). An Italian sculptor. He was born in Rome and studied under Righi. In 1775 he went to London, worked at first in the studio of Carlini, and executed various commissions, including decorations for Somerset House, and many portrait busts, including one of Sir Joshua Reynolds. He visited America in 1790, and while there carved busts of Washington (Boston Athenæum), Benjamin Franklin and Alexander Hamilton (Pennsylvania Academy). He submitted a plan for a monument of Liberty, to which Congress refused the necessary funds. Ceracchi also worked for some time in the employ of the Austrian court. His masterpiece is the bust of the poet Metastasio, in which the severe realism of his style is combined with idealistic charm and refined treatment. In 1796, when in Milan, he modeled a bust of Napoleon, who invited him to Paris; but his republican sympathies led him to join a plot with Arena, Topino-Lebrun, and others to assassinate the First Consul. One of the conspirators revealed the plot to Fouché, and Ceracchi and all his fellow conspirators but one were executed. Consult Taft, *History of American Sculpture* (New York, 1905), and Hue, *La conspiration de Ceracchi et Arène* (Paris, 1909).

CERAM, or **ZERAM**, Portug. pron. se-răn'. After Halmahera, the largest island of the Moluccas (q.v.), Dutch East Indies, lying west of New Guinea between long. 127° 55' and 130° 50' E. and lat. 2° 45' and 3° 40' S. (Map: East Indies, H 5). Including adjacent small islands, it occupies an area of 6621 square miles. The surface is mountainous, a range of volcanic origin traversing its length, and reaching in its highest elevation an altitude of about 9800 feet. The interior is covered with thick forests of coco and sago palms. The cultivated portion on the coast yields rice, tobacco, and cacao. The population is estimated at 67,000, chiefly Alfurus, who, in spite of Dutch rule, still retain their original customs and mode of life; the coast inhabitants, Mohammedan or Christian Malays, are civilized.

CERAMBYCIDÆ, sēr'am-bis'i-dē (Neo-Lat. nom. pl., from Gk. κεράμβυξ, *kerambyx*, horned beetle). A prominent family of cryptopentamerous beetles, commonly known as longhorns, and including more than 14,000 described species, of which 700 belong to the United States. A few find nourishment in herbaceous plants, but in most the soft, white grubs, with powerful mandibles, and sometimes legless, live concealed in burrows in wood, feeding upon it, and there passing the pupal stage also. The life of these beetles may be very long. They have been found still inhabiting the wood of furniture several years in use, and, according to Sereno Watson, may live 45 years; but it is not certain whether this prolongation of life takes place in the pupal or larval stage—probably the latter, as larvae entombed in dried wood are so poorly nourished that they must reach maturity slowly. Several kinds of these beetles produce sound by stridulation, and some even possess two sets of strid-

ulating organs. Several species greatly resemble Hymenoptera in appearance and behavior.

The family is subdivided into three subfamilies—the Prioninæ, Cerambycinæ, and Lamiinæ. The Prioninæ are the largest of the longhorns and have a thin, toothed margin on the thorax; the grubs infest the roots of the grape, apple, pear, poplar, pine, and other trees. Of the typical Cerambycinæ, 400 species occur in the United States, and adults may be found frequently on the goldenrod, feeding on the pollen. The locust borer (*Cyrtene robinia*) and the oak pruner (*Elaphidion villosum*), elsewhere described, are examples. Of the Lamiinæ, one form, the "sawyer," does much harm to pine trees; another destructive genus is *Saperda*, injurious to apples, raspberries, etc. The various bright-red beetles on milkweed also belong to this subfamily. For a synopsis of the classification and descriptive tables of genera, etc., consult Leng, *Bulletin Brooklyn Entomological Society*, vol. vii (Brooklyn, 1884), continued in *Entomologica Americana*, vols. i-iv (Brooklyn, 1885-89). See illustration under LONGICORN.

CERAMIC, sê-răm'ik (Fr. *céramique*, from Gk. κεραμικός, *keramikos*, ceramic, from *kéraμος*, *keramos*, potter's clay). A term used to designate the department of plastic art which comprises all objects made of clay, including terra cotta, porcelain, and all other forms of pottery (q.v.).

CER'AMICUS (Lat., from Gk. Κεραμικός, *Kerameikos*, from *κεραμῆς*, *kerameus*, potter, from *kéraμος*, *keramos*, potter's clay). The potters' quarter at Athens, which was divided into the Outer and Inner Ceramicus. In the Outer Ceramicus were buried those who had fallen in battle, and hence were honored by the state with a public funeral and a monument. For an account of this ceremony consult *Thucydides*, ii, 34. See **ATHENS**.

CERARGYRITE (from Gk. κέρας, *keras*, horn + ἀργύριος, *argyrites*, made of silver, from ἀργυρος, *argyros*, silver). A valuable ore of silver (AgCl) that crystallizes in the isometric system, and in color is light gray to light green. The name *horn silver* is frequently applied to cerargyrite in recognition of its resemblance to horn or wax. It is found largely in Peru, Chile, and Mexico, where the mineral occurs of a greenish color with native silver; also in the Ural Mountains and in Norway. In the United States it occurs in various localities in Colorado, Nevada, and Utah. This mineral is usually found in veins of clay slate, accompanied with other ores of silver, and chiefly in the higher parts of such veins.

CERASTES (Lat., Gk. κεράστis, *kerastes*, horned snake, from *kéras*, *keras*, horn). A genus of viperine serpents of northern Africa and Arabia, characterized especially by "the presence in the male, and sometimes in the female, of a pair of scale-covered, hornlike processes above the eyes." There are two species called "horned vipers." See **VIPER**.

CERASTIUM. See **CHICKWEED**.

CERATE (Lat. *ceratum*, wax plaster, from *ceratus*, p.p. of *cerare*, to wax, from *cera*, wax). A compound of wax with oily and medicinal substances in such proportions as to have the consistency of an unguent (q.v.). Cerates are intermediate between ointments and plasters, and their consistency should be such that when spread upon leather or cloth at ordinary temperatures and applied to the skin they will not be melted by its heat.

CERATIOCARIDÆ (Neo-Lat. nom. pl., from Gk. *κεράτιον*, *keration*, dim. of *képas*, *keras*, horn + *kápis*, *kavis*, shrimp). A family of interesting Palaeozoic crustacea, of the order Phyllocarida, members of a group of synthetic forms that are intermediate between the Phyllopoda on one hand and the Malacostraca on the other. See CRUSTACEA; PHYLLOCARIDA.

CERATITES, sér-à-tít'ez (Neo-Lat. nom. pl., from Gk. *képas*, *keras*, horn). A genus of discoid ammonioidean cephalopod shells, found as fossils in the Triassic rocks of Europe and America. The principal points of distinction are afforded by the broad, low saddles and the short, narrow, simple lobes of the suture line. The form of the suture line of this genus is often used as typical of one of the stages through which the sutures of the higher Ammonoidea pass in their evolution from the simple curve of the early nautiloids to the complex sutures of the later ammonoids. See CEPHALOPODA; AMMONITES.

CERATODUS (Neo-Lat., from Gk. *képas*, *keras*, horn + *ὀδός*, *odous*, tooth). A fish. See BARRAMUNDA.

CERATONIA. See CAROB.

CERATO'SA (Neo-Lat. nom. pl., from Gk. *képas*, *keras*, horn). An order or group of sponges, in which the skeleton consists of elastic fibres of a horny substance (spongin). The toilet sponges are examples. See SPONGE.

CERATOSAURUS (Neo-Lat., from Gk. *képas*, *keras*, horn + *σαῦρος*, *sauros*, lizard). A carnivorous dinosaur from the Upper Jurassic deposits of Colorado, distinguished from all other dinosaurs by the horn on the front of its skull. The animal was about 18 or 20 feet long, with the hinder part of the trunk, and also the tail, heavily built. Its head was rather large, and besides the single horn on the nose there was a prominent bony ridge in front of each eye. The teeth were numerous and well fitted for cutting and chewing flesh. The neck was short and thick. The fore limbs were remarkably small and were probably of no aid in locomotion, though the beast may have used them for holding food while eating. In contrast with the tiny fore limbs, the hind limbs were large and powerful and were armed with sharp retractile claws. The feet were digitigrade, i.e., they rested on the ends of the fingers instead of on the palms. The pelvic bones are peculiar in that they are ankylosed or joined together by the soldering of the joints. The pubes are long and are united at their ends to form a solid, massive piece, which probably served as an accessory support for the animal while resting. Another point of peculiarity is the form of the vertebral centra, which are flat on their anterior and concave on their posterior faces. Only a single species, *Ceratosaurus nasicornis*, is known to belong to this genus. See DINOSAURIA, and Plate of DINOSAURS.

CERATOZAMIA (Gk. *képas*, *keras*, horn + Lat. *zamia*, pine cone). A genus of Cycads, including two known species and occurring only in southern Mexico. The name refers to the occurrence of two conspicuous teeth or horns at the tip of each scale of the cone.

CERAUNIAN MOUNTAINS (Gk. *τὰ Κεραυνία ὄρη*, *ta Keraunia horē*, from *κεραυνός*, *keranos*, thunder, from their frequent storms). The ancient name of two mountain ranges. 1. A ridge of mountains in the northwest corner of Epirus, projecting into the Adriatic Sea, otherwise called Acroceraunian, now known as Khamar.

2. The southeastern extremity of the Caucasus Range. There was also a mountain in Libya called Ceraunian.

CERAUNOGRAPH (Gk. *κεραυνός*, *keranos*, thunder and lightning, and *γράφειν*, *graphein*, to write). An instrument for indicating or recording lightning discharges by means of the Hertzian waves they produce. All types employ some form of "wireless" receiver, most of them also a coherer and a decoherer. The earliest recorded long-distance observations of lightning by this means seem to be those of Ducretet on June 11, 1898, when he found that his "wireless" instrument had indicated 311 discharges between 2.30 and 3.40 p.m., or some hours before the lightning was to be seen or the thunder heard.

In 1900 Father F. L. Odenbach, S.J., of St. Ignatius College, Cleveland, Ohio, perfected a trial "wireless" ceraunograph which announced and recorded lightning discharges with some distinctness. In this and his later patterns Father Odenbach employed the copper cap of the college tower as a receiver, thus securing a surface of over 400 square feet in contrast to the smaller surface of the usual wire antennæ. This cap he later connected to two coherers, much improved by using high-grade graphite rods in place of the easily oxidized steel sewing needles, and through these the Hertzian current passes to relays which open and close the recording circuits. The Odenbach recorder has its pen fixed to the armature of an electromagnet and resting against a strip of paper wrapped about a clock-driven drum. Each lightning discharge within range of the coherers causes the pen to make a mark or nick in the straight line drawn by the pen at rest. The object of two coherers in this instrument is to permit regulation of the range of the instrument. The "long-range set" comprises a coherer of four graphite rods with a 1000-ohm relay, and is able to record lightning discharges distant 600 miles from the instrument. The "short-range set" has a coherer with a variable number of rods and 150-ohm relay; it does not record discharges more than about 200 miles distant. Both coherers record on the same record sheet, using different pens and differently colored inks. On this ceraunograph sheet no record is made of the other meteorological elements making up the totality of a thunderstorm. See BRONTOMETER.

Professor Turpain, of the University of Poitiers, devised several instruments of this class. The simpler forms record the time of occurrence of the lightning discharge. These instruments use the low-resistance (3-ohms) milliamperemeter of Richard Frères instead of attaching the pen to the armature of an electromagnet. Slight modifications serve to combine this lightning recorder with the Richard barograph, thus securing simultaneously on the same sheet the barogram and ceraunogram of the storm. A great improvement was Turpain's application of the principle of the bolometer to the recording of lightning, thus securing a photographic record of the relative intensity of the different discharges.

Bibliography. Consult: Ducretet, *Comptes rendus de l'Académie des Sciences*, vol. cxxvi, p. 1743 (Paris, 1898); *Nature*, p. 65 (London, May 15, 1902); Odenbach, *St. Ignatius College Meteorological Observatory, Annual Reports* 7, 8, 11, 12 (Cleveland, Ohio, 1902-07); Algué, *Monthly Weather Review*, vol. xxxii, pp. 273-

274 (Washington, June, 1904); *Scientific American*, vol. xciii, p. 278 (New York, 1905); *Richard Frères Catalogue*, "Instruments de precision—Météorologie" (Paris, 1913).

CERBERITE. See EXPLOSIVES.

CERBERUS (Lat., from Gk. Κέρβερος, *Kerberos*). In Greek mythology, the name of the dog—the offspring (according to Hesiod) of Typhon and Echidna—who guarded the portal of the infernal regions. Cerberus appears in early literature and art in connection with the twelfth labor of Hercules (q.v.). In the poets Cerberus is described as many-headed (Hesiod gave him 50 heads), but the popular conception seems to have been that of a dog with three heads, with a tail ending in a serpent, or with a mane of serpents.

CERCA'RIA (Neo-Lat., from Gk. κέρκος, *kerkos*, tail of a beast). A larval trematode worm, in a particular stage of development. See TREMATODA.

CERCELÉE, sër'slà' (OF. *cercel*, Fr. *cerceau*, Lat. *circellus*, a little ring, Lat. *circus*, circle), or RECCERCELÉE. In heraldry, a cross circling or curling at the ends, like a ram's horn.

CER/CIS. See JUDAS TREE.

CERCO/PES (Gk. κέρκωπες, *kerkōpes*). The two monkey-like gnomes who worried and robbed Hercules in his sleep. A poem bearing their name is attributed to Homer. They are figured with Hercules on a metope of one of the temples at Selinus.

CER/COPITHE/CIDÆ (Neo-Lat., from Gk. κερκοπιθήκος, *kerkopithēkos*, long-tailed ape, from κέρκος, *kerkos*, tail of a beast + πιθήκος, *pitēkos*, ape). A family of primates, containing all the Old World monkeys, other than anthropoid apes. (See MONKEY.) The several genera are described and illustrated under BABOON; LANGUR; MACAQUE, and many individual names.

CERDO'NIANS. A sect of Gnostics, founded by Cerdo, a Syrian who came to Rome about 140 A.D., and developed by his disciple Marcion (q.v.). They held that there were two primal causes—the perfectly good and the perfectly evil. The evil created the world, is the God of the Jews, and the author of the Old Testament. Jesus Christ is the son of the good Deity; He was sent into the world to redeem man from the evil Deity; but, since the material world is evil, his incarnation and sufferings were mere appearance. Deeming the human body the work of the evil Deity, the Cerdonians prohibited marriage, wine, and flesh eating, and advocated an ascetic life. Cerdo rejected the Old Testament, and all of the New except a part of Luke's Gospel and Paul's Epistles.

CEREALS, or CEREAL PLANTS (Fr. *céréale*, Lat. *cerealis*, pertaining to *Ceres*, goddess of agriculture). The plants belonging to the Gramineæ, or grass family, cultivated for their seeds as an article of food. They are also called corn plants, or bread plants. The most common cereals are wheat (*Triticum*), barley (*Hordeum*), rye (*Secale*), oats (*Avena*), rice (*Oryza*), maize or Indian corn (*Zea*), different kinds of millets (*Setaria*, *Panicum*, etc.), and various sorghums (*Sorghum* or *Andropogon*). The word *Cerealia* is sometimes used to designate cereal plants. Consult Hunt, *The Cereals in America* (1905), and Percival, *Agricultural Botany* (1900).

CER/EBEL/LUM. See NERVOUS SYSTEM.

CER/EBRAL HEMORRHAGE. See APOPLEXY.

CER/EBRA'TION (from Lat. *cerebrum*, brain, connected with Gk. κάρα, *kara*, Skt. *śiras*, head, Ger. *Hirn*, brain, Eng. dial. *harns*, brains), UNCONSCIOUS. A supposed reflex, automatic, or unconscious action of the cerebrum, conditioning an involuntary and unconscious elaboration and association of ideas. It "is the precise parallel, in the higher sphere of cerebral or mental activity, to the movements of our limbs, and to the direction of those movements through our visual sense, which we put in train volitionally when we set out on some habitually repeated walk, but which then proceed not only automatically, but unconsciously, so long as our attention continues to be uninterruptedly diverted from them." (W. B. Carpenter, *Principles of Mental Physiology*, London, 1879.) An illustration would be the "cropping up" of some name or date which we have previously "tried to recall" without avail. The phrase has now fallen into disuse, some writers referring the phenomena to a subconscious (q.v.) incubation, others invoking the known laws of association (q.v.), or substituting such terms as "nervous predisposition," "nervous set," or "determining tendency." Consult James, *Psychology* (New York, 1890). See DETERMINING TENDENCY.

CER/EBRIN, C₂₆H₄₂N₂O₁₅ (from Lat. *cerebrum*, brain). An organic substance found in the brain, the nerves, and in pus corpuscles, from the substance of which it may be obtained by extracting with alcohol. The cerebrin thus obtained is freed from lecithin by treatment with barium hydroxide and purified by recrystallization from alcohol. Cerebrin is a colorless, transparent substance insoluble in water and in cold alcohol and ether. When heated with dilute acids, it is transformed into the monosaccharide (simple sugar) galactose and the nitrogenous substance known as sphingosin.

CER/EBROSPINAL FLUID. A clear, limpid, slightly albuminous fluid having a saltish taste, faintly alkaline, and containing about 1.5 per cent of solid matter, consisting of sodium chloride, potassium chloride, sulphates, carbonates, alkaline and earthy phosphates, with minute traces of urea, sugar, sodium lactate, fatty matter, cholesterol, and albumen. It is found between the arachnoid membrane and the pia mater of the brain and spinal cord, within the skull and the vertebral canal, enveloping them so as to afford mechanical support and also to serve as a cushion to prevent injury from concussion, and to equalize pressure when the body is in different positions or the vessels of the brain contain varying amounts of blood. In certain diseases the amount of the cerebrospinal fluid is vastly increased. See HYDROCEPHALUS; NERVOUS SYSTEM AND BRAIN, and bibliography thereunder.

CEREBROSPINAL MEN'INGITIS. See MENINGITIS.

CER/EBRUM. See NERVOUS SYSTEM.

CER/EMO'NIAL (Fr. *cérémoniale*, Lat. *cærimonialis*, from *cærimonia*, ceremony), COURT. The origin of elaborate formalities in the daily life of a monarchical court is to be traced to the Eastern nations, whose genius is in harmony with such external expressions of reverence. The Roman emperors were at first cautious in the introduction of such ceremonial, owing to the traditional aversion of their subjects to kingly pomp. Diocletian was the first to establish it on a large scale, and the later Byzantine emperors largely developed it. Charlemagne,

CEREALS



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- 1 CORN - ZEA MAYS
- 2 BEARDED WHEAT - TRITICUM VULGARE
- 3 BEARDLESS WHEAT - TRITICUM VULGARE
- 4 BARLEY - HORDEUM VULGARE

- 5 RYE - SECALE CEREALE
- 6 MILLET - SETARIA ITALICA
- 7 RICE - ORYZA SATIVA
- 8 OATS - AVENA SATIVA

on assuming the title of Emperor, introduced a considerable amount of this formality into western Europe; and the whole spirit of the feudal system, with its regular gradations of rank and its complete theoretical organization, by which every member of the body politic had his own definite place, favored its extension. Some further impulse was given to such ceremonial by the marriage of the Emperor Otho II to the Greek Princess Theophano (972); but it reached a still more elaborate development at the court of Philip the Good, Duke of Burgundy (1419-67). This prince, whose power equaled that of the sovereigns of his time, but who yet could not place himself on a level with them, found satisfaction in establishing a ceremonial full of minute formalities. Through the marriage of Mary of Burgundy with Maximilian, these formalities found their way into the Austrian court, where they held their ground until the reign of Joseph II (1741-90), to whose modern ideas they were obnoxious. By dynastic connection they spread to Spain and found there a congenial soil, flourishing in all their fullness until comparatively recent times. In France ceremonial was not so elaborate before the reign of Francis II. Henry III also took great pleasure in the ordering of stately formalities; but their reestablishment dates from the marriage of Anne of Austria with Louis XIII (1615). Anne's son, Louis XIV, had only to put the finishing touches to the system, which is as inseparable from the idea of his reign as the wig is from any representation of his person. So burdensome did these ceremonials become at the French court that Frederick the Great declared that, were he King of France, he would appoint a deputy to attend to the ceremonies, so as to leave himself time for ruling. The Revolution destroyed ceremonial for a time, but Napoleon attempted to add to the prestige of his throne by its reestablishment. The Bourbon Restoration revived it still further, but the "July monarchy" adapted itself more to modern conditions. In England Queen Victoria's personal taste for simplicity abridged ceremonial observance during her reign, to be in a measure restored, however, by her successor, Edward VII. See PRECEDENCE; TITLES OF HONOR.

CEREMONY (Fr. *cérémonie*, Lat. *cærimonia*, sacred rite, probably connected with Skt. *karmān*, act, from *kar*, to do). Almost any act, when performed in a regular, orderly, and formal manner, and when viewed, not with reference to its object, but the mode of its performance, becomes a ceremony; and the more entirely the attention of the performers is withdrawn from the object of the act, and fixed upon the manner of its performance, the more *ceremonious* does it become. The purely formal character of ceremony is thus illustrated by Hooker: "The name ceremony," he says, "we do not use in so large a meaning as to bring sacraments within the compass and reach thereof, although things belonging to the outward form and seemly administration of them are contained in that name." The remark is applicable to the most trivial ceremonies of social life and of state pageantry, as well as to the most sacred rites of religion, for a ceremony which is its own object would scarcely be entitled to be regarded even as a ceremony.

Ceremonies may be divided into four classes: (1) religious ceremonies; (2) social ceremonies;

(3) state ceremonies; (4) international ceremonies.

Religious and state ceremonies will be treated respectively under their various denominations. See, for the first, LITURGY; MASS; RITE; for the second, CEREMONIAL, COURT; CORONATION; COURT; PARLIAMENT. Social ceremonies will, in a great measure, fall under the heads COURTESY; ETIQUETTE; FORMS OF ADDRESS; PRECEDENCE; and international ceremonies under AMBASSADOR; CONSUL; DIPLOMACY; ETC.

CEREMONY, MILITARY. A stated military exercise or formality, designed to show honor to an important person, to present the qualities of the troops concerned to advantage, or to facilitate their inspection. Ceremonies include reviews, musters, inspections; parades, guard mounting, funeral escorts, escort of the color and standard, and escorts of honor, which are described under their appropriate heads.

CE'RES (Lat., probably connected with *creare*, to create, *orescere*, to grow). The name given by the Romans to the Greek *Demeter* (*Δημήτηρ*), goddess of the grain, which she gave to mankind. In Greek mythology Demeter is daughter of Cronos and sister of Zeus, Poseidon, and Hades. By Zeus she became the mother of Persephone or Proserpina (q.v.). In Greek worship Demeter and Persephone (or Cora) are regularly united, as originally a dual impersonation of the "grain spirit," of whose worship many traces are still observable in the harvest customs of European peasants. Later, Demeter was goddess of vegetation and fruits in general. Etymologically, indeed, Demeter is "Mother Earth." At Eleusis (q.v.) they were goddesses also of souls. According to the Hymn to Demeter, Hades (Pluto) surprised Persephone as she was gathering flowers in a meadow, and bore her away to the lower world. Demeter sought her daughter, until at length she learned her fate from the all-seeing Helios (the sun). In her grief she hid herself, and the earth ceased to yield her fruit. At last Zeus sent Hermes to fetch Persephone, but Hades had persuaded her to eat a pomegranate and thus bound her to stay with him. At last the agreement was made that she should spend two-thirds of the year with her mother and one-third with her husband. In her wanderings Demeter was kindly entertained at Eleusis, and in requital extended her special blessing to the spot, and thence sent out Triptolemus (q.v.) to bear the knowledge of agriculture to the world. The worship of Demeter was nearly universal in the ancient world, but probably the most important cult was at Eleusis in Attica. (See ELEUSINIAN MYSTERIES.) There was also a very important cult at Athens, where the Thesmophoria (see GREEK FESTIVALS) were celebrated. In various districts, especially in Argolis, the goddesses were distinctly chthonic and were regarded as awful deities of the lower world. Swine and horses were especially connected with them. They are often distinguished in works of art by a bunch of grain, or a torch, or, somewhat rarely, by the mystic box. Demeter also appears as a *Courotophos*, a guardian of children, represented as a seated figure holding a child. On vases representations of the Eleusinian story are not infrequent, and the rape of Persephone is frequent on sarcophagi, but statues of the goddesses are not common. The most striking is the beautiful seated figure from Onidus (q.v.), now in the British Museum. Fragments of the

colossal cult statues at Lycosura in Arcadia, the work of Demophon, are now at Athens. Another statue, of different-colored stones, is in Munich. The Romans adopted the worship of the Greek Demeter about 493 B.C. and identified her with their own goddess of the growth of the harvest, Ceres, who along with Tellus, the earth, was honored with special sacrifices, both after seed time and just before the harvest. The plebeians especially worshiped her. Her great festival was the *Cerealia*, April 12-19, which was celebrated with games in the circus. Consult: Mannhardt, *Wald und Feldkulte* (Danzig, 1875-77); *Mythologische Forschungen* (Strassburg, 1884); P. R. Förster, *Der Raub und die Rückkehr der Persephone* (1874); Frazer, *The Golden Bough* (2d ed., London, 1900; 3d ed. is in progress); Jane Harrison, *Prolegomena to the Study of Greek Religion* (Cambridge, 1908); Preller, *Demeter und Persephone* (Hamburg, 1837); Lenormant in Daremberg and Saglio, *Dictionnaire des antiquités grecques et romaines* (Paris, 1892); Farnell, *Cults of the Greek States*, iii (Oxford, 1907).

CERES. The earliest known of the planetoids (q.v.). It was first seen by Piazzi at Palermo, Jan. 1, 1801, the first day of the nineteenth century. Piazzi continued to observe its motion till February 11, when illness obliged him to discontinue his observations. News traveled slowly in those days, and the continental astronomers did not hear of Ceres until the end of March. By that time the planet had approached too near the sun for observations to be possible. Nor did the astronomers of that day possess a method of computing planetary orbits, when the observations upon which such computations are based extended over a period of time as short as six weeks. Under these circumstances it was not possible to predict what would be the planet's exact position on the sky when it should become visible in the following winter. There was consequently great danger of the planetoid being lost again. Fortunately Gauss, then only 24 years of age, quickly devised a new method of orbit computation, and succeeded in predicting the planet's motions with sufficient accuracy to enable Von Zach and others to reobserve it at the end of the year, when Gauss's computations had become available. Ceres is the largest of the planetoids, its diameter, according to Barnard, being about 480 miles. Its orbit has a mean radius of 257,000,000 miles and is traversed in about four and a half years.

CEREUS (Lat., waxy, from *cera*, wax). A genus of plants of the family Cactaceae, containing 100 or more species, among which are some of the most splendid flowers of that family. The species abound in the southwestern part of the United States, extending through Mexico and Central America into South America. One of these is *Cereus speciosus*, one of the most common greenhouse plants in the United States, and sometimes cultivated even in windows. Its large flowers are of a fine scarlet color, the inner petals with a violet tinge. The fruit, when well ripened, is of a delicious flavor. The plant is a native of Mexico.

A number of species are grown under the name of night-blooming cereus. Of these, *Cereus nycticalus*, *Cereus triangularis*, and *Cereus grandiflorus* are the best known. Their large, fragrant, white flowers are exceedingly beautiful. Some of the species are truly arborescent—the Suwarro, *Cereus giganteus*, of Arizona, California,

and northern Mexico, attaining a height of 50 feet or more and 18 inches to 2 feet in diameter. The fruits of this species are eagerly sought for food by the natives. *Cereus pasacana*, of Argentina, is a similar tree-like form. They branch sparingly and resemble huge candleabra in outline. The night-blooming forms have cylindrical or angled stems and are trailers or climbers. The others vary in form between these extremes. See Plate of DESERT PLANTS.

CERIALIS, PETILIUS. A Roman general, legate of the ninth legion in Britain, defeated by Boadicea (q.v.), in 61 A.D. In 69 A.D., when Vespasian claimed the Empire, Cerialis hastened to join his army in Italy. Having crushed the revolt of Civilis (q.v.), he was sent in 71 A.D. to Britain as consular legate, and in great part subjugated the Brigantes. Agricola (q.v.) served under him as commander of the twentieth legion.

CERIGNOLA, chà'rè-nyô'la. An ancient city in the Province of Foggia, south Italy, 23 miles southeast of Foggia, on a hill in a fertile but treeless plain (Map: Italy, K 6). It markets cotton and oil and is celebrated for the victory won April 28, 1503, by the Spaniards over the French, which established Spanish authority in Naples. Pop., 1901, 34,195; 1911, 38,180.

CERIGO, chër'è-gô, or KYTH'ERA (ancient *Cythera*, *Kythera*). One of the largest of the Ionian Islands, situated off the south coast of Greece, part of the Province of Arcadia, in about lat. 36° 15' N., long. 23° E. (Map: Greece, D 5). Area, 100 square miles. Its surface is mountainous, reaching an altitude of 1650 feet, and the soil is poor. Corn, wine, and olives are raised. It is noted for its cattle, of which it raises more than any other of the Ionian Isles. The island is noted for its two beautiful caverns. Its coast being steep and rocky, it has no good harbors. In ancient times Cythera was considered the sacred abode of Venus. Pop., 1889, 10,524; 1896, 12,306; 1907, 13,102. The port is Kapsali (pop., 1500).

CERINTHUS (Lat., from Gk. Κήρινθος, *Kêrinthos*). A heretic who lived at the close of the Apostolic age, but of whom we have nothing better than uncertain and confused accounts. It is said that he was an Egyptian, perhaps also a Jew by birth, and studied philosophy in Alexandria. From Egypt he passed into Asia Minor, and lived in Ephesus contemporaneously (according to the belief of the Church) with the aged Apostle John. Tradition tells us that John held the heretic in such detestation that on a certain occasion, when he encountered Cerinthus in the baths of Ephesus, he immediately left the place, saying to those about him: "Let us flee, lest the bath should fall while Cerinthus, the enemy of the truth, is there" (Irenæus, *Heresies*, iii, 3, 4). The fathers contradict one another in their accounts of Cerinthus. Irenæus, who is the earliest source, gives the following description: "Cerinthus again, a man who was educated in the wisdom of the Egyptians, taught that the world was not made by the primary God, but by a certain Power far separated from Him, and at a distance from that Principality who is supreme over the universe, and ignorant of Him who is above all. He represented Jesus as having not been born of a virgin, but as being the son of Joseph and Mary according to the ordinary process of generation, while he nevertheless

was more righteous, prudent, and wise than other men. Moreover, after his baptism, Christ descended upon him in the form of a dove from the Supreme Ruler, and that then he proclaimed the unknown Father and performed miracles. But at last the Christ departed from Jesus, and that then Jesus suffered and rose again, while Christ remained impassible, inasmuch as he was a spiritual being." (*Heresies*, i, 26, l.) This description places Cerinthus among the Gnostics (q.v.). (Cf. CERNONIANS.) Later Gaius, a Roman presbyter, about the beginning of the third century, says he held that "after the resurrection the kingdom of Christ is an earthly kingdom, and again that men shall live in the flesh in Jerusalem and be the slaves of lusts and pleasures." On the basis of such statements it was sometimes held that Cerinthus was the author of the Apocalypse, and that the Gospel and Epistles of John were written to combat his views. Epiphanius represents him as a Judaizer, laying emphasis on circumcision and the observance of the law. The present tendency is to discredit the tradition of Judaism, and to regard him as a Gnostic, who agreed with the Jewish Ebionites (q.v.) in holding, as did some other Gnostics, that the divine Christ came into the human Jesus at his baptism and left him before his death. See GNOSTICISM.

CERITE (from Neo-Lat. *cerium*). A hydrated cerium silicate of complex composition containing other metals of the cerium group, as didymium and lanthanum. It crystallizes in the orthorhombic system and is of a brownish-red color. It is found at Bastnäs in Vestmanland, Sweden, and is the chief source of the element cerium. A partial separation of the metals contained in cerite may be effected by treating the mineral with sulphuric acid and separating the resulting sulphates by taking advantage of the differences in their solubility. Cerium may then be completely isolated from the insoluble portion by converting this into nitrate and subjecting to a process of decomposition, the nitrate of cerium being more readily broken up by heat (and hence rendered insoluble) than the other nitrates present.

CERIUM (Neo-Lat., named after the planet Ceres). A metallic element simultaneously discovered, in 1804, by Klaproth in Germany and by Berzelius and Hisinger in Sweden. The substance found by them was, however, impure, containing considerable quantities of the oxides of lanthanum and didymium. Pure cerium oxide was first isolated by Mosander in 1842. Cerium is not found native, but occurs combined in many Swedish minerals, especially as the silicate in cerite, which contains 56 per cent of cerium peroxide. It also occurs in samarskite, a mineral found in North Carolina. After cerium has been isolated from the other constituents of cerite (q.v.), it may be obtained in the metallic state by the electrolysis of its anhydrous chloride, or by fusing the latter with metallic sodium.

Cerium (symbol, Ce; atomic weight, 140.25) is a soft, steel-gray, ductile, and malleable metal whose melting point lies between that of silver and that of antimony. Its specific gravity is 6.786. Water is slowly decomposed by it at ordinary temperatures. It is but slightly attacked by sulphuric and nitric acids if these are highly concentrated; but dilute acids attack it with great violence. Unlike the other metals of the group of "rare earths," it forms two series of salts, the colorless cerous and the

orange-colored ceric salts. Cerous sulphate, $\text{Ce}(\text{SO}_4)_3$, is used to produce a deep, blue-black color on fabrics. Cerous oxalate is sometimes used in medicine, especially for the vomiting of pregnancy. In quantitative determinations cerium is weighed in the form of its dioxide, CeO_2 .

CERNUSCHI, chër-nūs'kê, ENRICO (1821-96). An Italian economist. He was born in Milan and took part in the Italian revolution of 1848. In 1850 he took refuge in France and engaged in banking. He became a principal stockholder of *Le Siècle*, and in that journal discussed economic subjects and denounced socialism, so that his life was in peril from the Communists, in 1871. He visited Egypt, China, and Japan, bringing back valuable ethnological and art collections. These he bequeathed to the city of Paris, and they now form the Musée Cernuschi, opened in 1898. He visited the United States in 1877 and championed the cause of bimetallism—a word he is supposed to have originated. Among his works are: *Mécanique de l'échange* (1865); *Illusions des sociétés coopératives* (1866); *Or et argent* (1874); *Silver Vindicated* (1876); *Le Bland Bill* (1878); *Le bimétallisme à quinze et demi* (1881); *Le grand procès de l'union latine* (1884).

CERNY, chër'né, FREDERICK. See GUTHRIE, FREDERICK.

CE'RO (from Sp. *sierra*, saw, sawfish, from Lat. *serra*, saw). An uncommon marine fish (*Scomberomorus regale*) similar to, but larger than, the Spanish mackerel, reaching 20 pounds in weight. It belongs to the western Atlantic. Another species, the sierra (*Scomberomorus caballa*), is called "king cero" and may weigh 100 pounds and is found in the warmer parts of the Atlantic. Both are good food.

CEROGRAPHY (from Gk. *κηρογραφία*, *kêrographia*, encaustic painting, from *κηρογραφείν*, *kêrographéin*, to paint with wax, from *κηρός*, *kêros*, wax + *γράφειν*, *graphein*, to write). The art of writing or engraving on wax, as practiced by the ancients, especially the Romans, who wrote with the stylus on wax tablets. The term is also applied to wax painting, usually known as encaustic painting (q.v.).

CEROPLASTIC (Gk. *κηροπλαστικός*, *kêroplastikos*, modeling in wax, from *κηρόπλαστος*, *kêroplastos*, molded in wax, from *κηρός*, *kêros*, wax + *πλάσσειν*, *plassein*, to mold). The art of modeling in wax. See WAXWORK.

CERQUOZZI, chër-kwôt'sê, MICHELANGELO (1602-60), called from his subjects delle Battaglie or delle Bambocciate. An Italian battle and genre painter. He was born in Rome and studied under Cavaliere d'Arpino and Jakob de Hase. He began by painting battle scenes and still life, but later took up the so-called bambocciate style which Van Laer had made popular in Rome. His folk scenes are strong in color and line and show deep insight into the character and life of the people. His masterpiece is the "Insurrection of Masaniello in Naples" (Palazzo Spada, Rome). Other important paintings are "St. John the Baptist Preaching"; three interesting Roman folk scenes in the Galleria Nazionale, Rome, and two fine battle pieces in the Dresden Gallery. He is represented in nearly all the principal museums of Europe.

CERRITO, chër-rê'tô, FRANCESCA, called FANNY (1821-). A French ballet dancer, born in Naples. She made her début in Paris in a ballet, *La fille de marbre*, written by her hus-

band, M. Saint-Léon (1847). She also appeared in *La vivandière*, *Le violon du diable*, and in *Gemma*, the scenery of which she designed with Théophile Gautier. So great were her talents and charm that the Italians called her "the fourth of the Graces." She retired from the stage in 1854.

CERRO DE PASCO, sēr'rō dā pās'kō. The capital of the Department of Junín, Peru, situated in the sterile region 14,000 feet above sea level, at the north end of Lake Chinchaycocha (Map: Peru, B 6). The temperature averages 40° the year round. The town is poorly built over the silver mines which make it famous. They are, however, not so productive as formerly. The companies concerned have since turned their attention to the copper and coal deposits in the neighborhood. The copper output alone amounted to 2,152,000 pounds in 1907, more than compensating for the slight decline in the silver output. Pop., about 14,000.

CERRO GORDO, sēr'rō gōr'dō (Sp., Big Mountain). A mountain pass near Jalapa, on the National Road between Vera Cruz and the city of Mexico. Here, on April 18, 1847, during the war between the United States and Mexico, General Scott, with a force of 8500, dislodged and defeated General Santa Anna, with a force of about 12,000. While Scott was advancing from Vera Cruz, the Mexicans had strongly intrenched themselves in a position which seemed impregnable, their right resting on a precipice rising above an almost impassable ravine, and their left occupying the heights of Atalaya and Cerro Gordo. Scott, arriving before the fortifications on April 14, spent two days in reconnoitring, and on the 17th sent General Twiggs by a precarious pathway to take the high ground on Santa Anna's left, and then, if possible, cut off his retreat by occupying the Jalapa road in his rear. Twiggs succeeded in taking Atalaya on the 17th, and on the following day the Americans attacked with great vigor in front and flank, taking the height of Cerro Gordo, capturing the Mexican camp, securing 3000 prisoners, and forcing the rest of the Mexican army in great confusion from the field. The Americans lost 63 killed and 368 wounded (General Shields being among the latter); the Mexicans probably as many as 1000, though the exact figures have never been ascertained. The victory enabled Scott to advance towards the city of Mexico and did much towards demoralizing the Mexican troops. Consult: Bancroft, *History of Mexico*, vol. v (San Francisco, 1885); Wright, *General Scott* (New York, 1894); and C. M. Wilcox, *History of the Mexican War* (Washington, 1892).

CERROS. See CEDROS.

CERTALDO, chēr-tāl'dō. A town in the Province of Firenze, central Italy, 35 miles southwest of Florence (Map: Italy, F 4). It was the home of Boccaccio, and his house (restored in 1823) and tomb are of general interest. Pop., 1901, 9129; 1911, 10,439.

CERTHIDÆ. See CREEPER.

CERTIFICATE (Fr. *certificat*, from ML. *certificatus*, p.p. of *certificare*, to certify, from Lat. *certus*, sure + *facere*, to make). A written testimony to the truth of a certain fact or facts. It may be required or authorized by law, when it has an official character and is receivable as evidence of the facts therein stated; or it may be voluntary, when it has no greater value as evidence than any other private writing.

Examples of legally authorized certificates are certificates of an insolvent's or a bankrupt's discharge; certificate of the appointment and qualification of a person as the administrator of a decedent's estate, or as a notary public, or other officer; certificate that a ship has been registered; certificate by a notary public or similar officer that the execution of a document has been duly acknowledged before him. For the legal effect of such certificates as evidence, consult the authorities referred to under EVIDENCE.

CERTIFICATE OF MERIT, UNITED STATES ARMY. A certificate of merit, awarded by the President on the recommendation of his commanding officer to an enlisted man who has distinguished himself in the service. According to Article XXV, United States Army Regulations, recommendations for a certificate of merit must originate with an eyewitness, preferably the immediate commanding officer. Each case must be submitted separately, forwarded through the regular channels, and must be favorably indorsed by each commander. Extra pay at the rate of \$2 per month from the date of distinguished service is allowed to each enlisted man to whom a certificate of merit is granted.

CERTIORARI, sēr'shi-ō-rā'ri (Lat., to be certified, from *certior*, comparative of *certus*, sure). A common-law writ issued by a superior court to an inferior one, or by any court having jurisdiction to a body acting in a quasi-judicial capacity, such as commissioners, magistrates, assessors of taxes, etc., for the purpose of securing a review of the proceedings of the tribunal or body to which the writ is directed. The writ issues only when there is no other adequate remedy, and it is used in both criminal and civil cases. It requires the record of a proceeding in the inferior court or before the quasi-judicial body to be certified by that court or body and returned to the court issuing the writ for the purpose either of reviewing the same or of removing the action or proceeding to the higher court for trial. When certiorari is used as a means of review, it raises only a question of law for the consideration of the reviewing tribunal—the question, viz., whether or no the inferior tribunal had jurisdiction or proceeded in accordance with law. For example, if a board of assessors of taxes should decide that the property of a bank invested in United States bonds could be taxed under the authority of the State, they would decide a question of law which might, by means of a writ of certiorari, be reopened before superior tribunals, and ultimately before the Supreme Court of the United States. It would not, however, raise any question of fact or confer upon the superior court any ministerial power vested in the board of assessors of taxes. The writ is granted or refused at the discretion of the superior court, and the usual result is that the proceedings below are either affirmed or set aside. In courts of equity a similar use is made of certiorari, which may be granted on application by original bill under the "Evarts Act" of March 3, 1891. Certain decisions of the Circuit Court of Appeals may be reviewed by the United States Supreme Court by certiorari.

In England the writ of certiorari may in civil cases be issued by any judge or division of the High Court of Justice, and in criminal cases it issues out of the Crown Office Department of the central office, under the attestation of the Lord Chief Justice. It is now chiefly

used in the latter division and is the usual mode of correcting excesses of justices of the peace in miscellaneous matters. Consult: Spelling, *Treatise on Extraordinary Relief in Equity and at Law* (Boston, 1901); Wood, *Treatise on the Legal Remedies of Mandamus and Prohibition*, etc. (3d ed., Albany, 1896). Cf. APPEAL; ERROR, WRIT OF.

CERTOSA, chër-tō'zà (It.). A monastery of the Order of Carthusians, whence the Italian name is derived. The Certosa di Chiaravalle in Lombardy is an interesting example of thirteenth-century Lombard architecture in brick, and offers an early example of those Lombard domes which are externally covered by a many-storied arcaded structure, surmounted in this one example by a tower. Larger and far more splendid is the Certosa di Pavia, also in Lombardy, one of the most complete and beautiful monuments of Italian art, founded in 1396 by Gian Galeazzo Visconti, and begun in the same late Gothic style as the cathedral of Milan. Before the nave had been completed in this style, the influence of the early Renaissance had become supreme, and the dome (resembling somewhat that of Chiaravalle), the choir, and transept, as well as the beautiful cloisters, were executed in the new style, blended with features of the traditional earlier Lombard treatment, and with rich and artistic details in terra cotta, as was also the façade, begun in its present form in 1491. This is the masterpiece among Italian Renaissance façades, not only for the richness and perfection of its sculptures, but for the harmony of its design. It is, however, like most Italian church façades, a mere decorative screen or frontispiece, not organically related to the design of the church behind it. The interior of the church is a Latin cross (249 × 173 feet), with 14 chapels, apsidal transepts, and a dome over the intersection. It is a museum of Renaissance sculpture and painting, most of the latter the work of Borgognone, who also designed the choir stalls. The sepulchral monument of the founder is mainly by Cristoforo Romano. The most famous sculptors who worked on the cloisters and façade were the brothers Montegazza, Amadeo, Fusina (fifteenth century), Briosco, Giacomo della Porta, Busti, and Solari (sixteenth century). This monument strongly influenced Lombard sculpture throughout its golden age. Other valuable examples are the Certosa of the Val d'Ema, near Florence, with cloister by Brunelleschi; and that adjoining the baths of Diocletian at Rome, built in part from Michelangelo's plans and now used as a museum (Museo della Terme). The monastery of San Martino at Naples is also a Certosa, though not commonly known by that name. In all these Carthusian monasteries an essential feature was the cloister surrounded by the individual dwellings of the "Fathers," each with its small garden.

CERUMEN (Neo-Lat., from Lat. *cera*, wax). Ear wax, a yellow, oily secretion from certain glands lying in the external auditory canal. Its function is to render the skin of this part pliable and to entangle dust, etc., which may enter the canal. Its bitter taste and sticky consistency are repellent to insects which might seek to enter the auditory canal. The motion of the jaw in eating and talking and the outward growth of the epithelium normally prevent its accumulation. When it does accumulate in sufficient quantities to block the ear

canal it is said to be "impacted" and causes partial deafness, and sometimes a buzzing noise in the head, from adhering to the eardrum. It must be removed by syringing in such cases.

CERUSITE (from *ceruse*, from Lat. *cerussa*, white lead). Natural lead carbonate ($PbCO_3$). It crystallizes in the orthorhombic system and has a vitreous or pearly lustre, and is of a gray or grayish-black color, sometimes tinged with blue or green, owing to the presence of salts of copper. Clusters of interlaced, fibrous crystals pass into silky aggregates and masses. Granular, compact, and earthy masses are common. It is formed by the alteration of galena or lead sulphide, which, as it oxidizes to sulphate, may be changed to a carbonate by means of solutions of calcium bicarbonate. The most famous localities are the lead mines of Siberia and the Altai region; also various places in Sweden and Germany, while fine crystals are found in Cornwall, England. In the United States it occurs at Phoenixville, Pa., and at lead deposits in Virginia, North Carolina, Missouri, Wisconsin, Colorado, Utah, and Arizona. Dana reports its observation as a recent formation at Pompeii, Italy, and at Laurium, Greece; also in stalactical crusts near Kommern, Rhenish Prussia.

CERVANTES SAAVEDRA, sêr-vân'têz, *Sp. prom. thër-vân'tàs sã'ã-vã'drà*, MIGUEL DE (1547-1616). The most famous of all Spanish writers, and author of the world-renowned *Don Quixote*. His early years are involved in much obscurity. It is known that he was of pure Castilian stock, being the second son and fourth child of Rodrigo de Cervantes and Leonor de Cortinas; that his birthplace was Alcalá de Henares, although for 200 years this was a matter of dispute, seven other cities claiming the honor (Seville, Toledo, Esquivias, Madrid, Lucena, Consuegra, and Alcalázar de San Juan); and that he was baptized in the parish church of St. Mary the Greater, in Alcalá de Henares, Oct. 9, 1547, whence it is plausibly conjectured, in view of his name, that he was born on the Michaelmas Day preceding. Rodríguez Marín believes Cervantes studied in the Jesuit school at Seville, 1564-65; another tradition, long generally discredited, stated that Cervantes spent two years at the University of Salamanca. Recently Doña Blanca de los Ríos de Lampérez has defended this tradition, and would fix the period from about 1582 to 1584. Although it cannot be categorically asserted, there is some ground for believing that he studied under López de Hoyos, a teacher of some celebrity in Madrid, for when, on the occasion of the death of Isabel of Valois, Philip II's third wife, Hoyos edited a memorial volume of verse, six of the poems were contributed by Cervantes, whom Hoyos calls "his beloved pupil"; but this complimentary phrase must not be pressed too hard. Until 1899 these poems stood as his earliest-known essay in literature; but in that year Foulché-Delbosc published a sonnet, written by Cervantes in honor of the same queen while she was still alive, although at exactly what date is not known. But his practical education in the knowledge of life—the education which comes from action and hardship and disappointment—still lay before him.

In December, 1569, we find him in Italy, but how or why or when he went is unknown. For a while it was thought that he went with the special nuncio Giulio Acquaviva, who returned to Rome in December, 1568, but we have no evi-

dence to that effect, and it is now generally agreed that he probably entered the company of Diego de Urbino as supernumerary towards the end of 1568, and probably did not enter Acquaviva's service until after the latter had become a cardinal. This would place his service in Acquaviva's household between 1570 and 1574 (when the Cardinal died). But we have no positive evidence of his being in the army until we reach the battle of Lepanto (Oct. 7, 1570), in which, although seriously sick, he played a gallant part, receiving wounds one of which crippled his left hand for life, "for the greater glory of his right," as he phrased it. He also took part in engagements before Navarino, Corfu, Tunis—after which he was for a time again in Italy, and there presumably acquired that knowledge of the language which later bore fruit in the slight coloring of Italian idioms that are to be found here and there in his works. In 1574 we find him in the garrison at Palermo as *soldado aventajado*, which was a necessary step towards a captaincy, which he strove to attain. In order to press his claims thereto, he set sail (1575) for Spain, but the vessel was seized by Algerine pirates and all on board carried into Algiers as prisoners.

Cervantes' captivity lasted for five years, during which he showed noteworthy fortitude and intrepidity, offering himself as leader in all attempts of the Christians to escape, attempts always frustrated at the last moment; forced to witness the almost daily atrocities which his owner, Hassan Pasha, practiced upon his fellow prisoners, and often himself threatened with inhuman tortures, although, through some unexplained influence, the threats were never carried out. Finally the sum demanded for his ransom, painfully raised by his widowed mother and sister, and eked out by the efforts of a pious friar, Juan Gil, and some Christian merchants in Algiers, was paid, and Cervantes was free to return to Spain. This period of his career deserves to be dwelt upon, for it was here that his character was ripening and the foundation being laid for that wide understanding of human nature which makes his great work a delight to all peoples and at all times. It was this ordeal which waked the soldier, the "mutilated of Lepanto," from his dream of romance and prepared him for transition into the writer capable of the higher and finer humanity of the *Don Quixote*. The plays which he is said to have written in captivity are lost. The earliest-known literary efforts after his return to Spain are some sonnets published in 1583, the year before his marriage to Catalina de Salazar y Palacios, a young lady of good family from Esquivias, in New Castile. Little is known of the marriage beyond the fact that she bore him no children and that she outlived him by 10 years. It is said, however, that while courting her he found inspiration to write his pastoral novel, the *Galatea*, published in 1585. Extravagant, artificial, and affected, like others of its type, it nevertheless served to bring Cervantes into notice; and, although never finished, seems to have been regarded by him to the last with especial fondness, for in *Don Quixote* he makes the Barber say: "This book has some invention; it proposes something and concludes nothing; it behooves us to wait for the second part which he promises." To this and the following years belong a long line of dramas—20 or 30 according to his own account. Of most of these even the

titles have perished. We know of the *Gran Turquesca*; the *Jerusalén*; the *Batalla naval*; the *Amaranta*; the *Bosque amoroso*; the *Arzinda*, and the *Confusa*, which the author flattered himself was "good among the best of the comedies of the cloak and sword." The two surviving plays are *El trato de Argel* ('Life in Algiers') and *La Numancia*, which deals with the siege of Numantia and its capture by Scipio Africanus. Together these two plays show the best and the worst of Cervantes' dramatic talent. The former is an incoherent medley of personal reminiscences, in which demons and lions and such moral abstractions as Necessity and Opportunity are introduced side by side with real characters. *La Numancia* is a tragedy of heroic energy and intense pathos, which has justly excited the admiration of Shelley, Goethe, and August Schlegel, and is little less than remarkable when we remember that Shakespeare had not yet written, and neither Corneille nor Racine had been born. Nevertheless, it must be recognized that Cervantes was practically a failure as a dramatist and in 1587 was forced to leave the Madrid stage. It is true that Lope de Vega's earliest play dates from about 1574, when he was 12 years of age, and that the play seems to have been well received. But of Lope's plays previous to 1593 very few have survived and to almost none of these can a definite date be assigned. Consequently we are fairly safe in saying that it was Cervantes' own failure (and not Lope's popularity, as tradition says) that drove him from the stage. After forsaking Madrid he lived in straitened circumstances. In 1588 he received the position of commissary at Seville, under the Proveedor-General of the Invincible Armada. He seems to have held this place until 1593. In 1594 he was made taxgatherer in Granada, but three years later not only lost the position, through an absconding subordinate, but suffered a three months' imprisonment besides. On May 7, 1595, he won a prize in a poetical joust held at Saragossa in honor of St. Hyacinth. In 1602 it seems probable that he was imprisoned again, but there is no positive proof to that effect. In that year there appeared from his pen some laudatory verses (a sonnet) in Lope de Vega's *La Dragontea*. In 1605, while residing in Valladolid, he once more appeared as an author, this time destined to win immortal fame. In writing *Don Quixote*, which popular tradition (for which we have so far no foundation) says was begun in jail, Cervantes' avowed purpose was "to diminish the authority and acceptance that books of chivalry have in the world and among the vulgar." Yet he did not intend to burlesque the old Spanish knight-errantry, for this was already a thing of the past. He sought rather to put an end to the absurd and affected romances which it was then the fashion to read; and while it is significant that after the appearance of *Don Quixote* no new chivalresque romance was published in Spain, it is also significant that no romance of chivalry had been printed at Madrid during the entire reign of Philip II. What further purpose Cervantes had, and what hidden allegoric meaning lurks in *Don Quixote*, has provoked endless controversy. One of the latest critics of Spanish literature, Mr. Fitzmaurice-Kelly, has very sensibly said: "That an allegory of human life was intended is incredible. Cervantes presents the ingenious gentleman as a

prince of courtesy, affable, gallant, wise on all points save the trifling one which annihilates time and space and changes the aspects of the universe; and he attaches to him Sancho, self-seeking, cautious, practical in presence of vulgar opportunities. The types are eternal. But it were too much to assume that there exists any conscious symbolic or esoteric purpose in the dual presentation." Carlyle, with curious ineptitude, calls *Don Quixote* "our joyfulest modern book." He would have done well to recall that the Barber in *Don Quixote* speaks of Cervantes as "rather a man of sorrow," and to have heeded Landor, who says that readers who see nothing more than a burlesque in *Don Quixote* have but a shallow appreciation of the work.

Though received with enthusiasm, *Don Quixote* brought no pecuniary reward to the author. He lived wretchedly in squalid quarters in a poor section of Valladolid, having with him his wife, his sisters, and his natural daughter. One summer night in 1605 Gaspar de Espeleta was stabbed in what he himself called a fair fight in front of Cervantes' house. He was carried into the house (but not into the Cervantes apartment) and later died there, without having admitted that he knew the name of his adversary. All of the Cervantes family (except the wife, who was absent from the city at the time) and several other lodgers in the house were arrested and jailed for complicity in the crime, although there is not a scintilla of evidence to connect them therewith. Later they were all released, and for the rest of 1605 and until the summer of 1608 we have no trace of Cervantes personally. In 1608 he is present in Madrid at the marriage of his daughter and in April, 1609, joined the Confraternity of Slaves of the Most Blessed Sacrament. In 1610 appeared his sonnet on Diego Hurtado de Mendoza, who in the previous century had been a great patron of literature. We hear little else of him during the years 1610-12 except in connection with a lawsuit concerning the dowry of his natural daughter. In March, 1612, he was present at a riotous meeting of the Academia Selvaje. He seems to have received the habit of a tertiary of St. Francis in 1613 at Alcalá de Henares. To this same year belong his sonnet to Diego Rosel y Fuenllana, and certain verses to Gabriel Pérez del Barrio Angulo. But the most important event of the year 1613 was the appearance of the volume containing the 12 *Novelas Ejemplares*, dedicated to the Count of Lemos, who at this time became his patron and continued as such during the rest of Cervantes' life. These 12 Exemplary Tales are exquisite gems, masterpieces in little; and if Cervantes had not written *Don Quixote*, they by themselves would still entitle him to rank as the foremost novelist of Spain. Although probably finished before the *Novelas Ejemplares*, it was not until 1614 that Cervantes published, with a dedication to Rodrigo de Tapia (son of a Minister of State, Pedro de Tapia), his *Viaje al Parnaso* ('Journey to Parnassus'), a rhymed review of contemporary poets. Cervantes had for some time past been working on the Second Part of *Don Quixote*, and appears to have reached the fifty-ninth chapter before he learned of the spurious Second Part of *Don Quixote* which had been licensed at Tarragona, July 4, 1614, and claimed to be the work of Alonso Fernández de Avellaneda. He finished his own Second Part on

Feb. 25, 1615. It was approved two days later, and received a privilege for 20 years on March 31. The printing went along slowly, so that the *Fé de erratas* and the *Tassa* were not dispatched until October 21, and 10 days later Cervantes wrote his dedication to the Conde de Lemos. But on some technicality the book was still held back for a while. In the meantime he had put another volume through the press: *Ocho comedias y ocho entremeses nuevos, nunca representados*. This book was ready for the public before Nov. 1, 1615, whereas the final approbation of the Second Part of *Don Quixote* was not dated until November 5, so that the volume itself can hardly have appeared before December, making it the last of his books that Cervantes saw in print. With the exception of *Pedro de Urdemalas*, the comedias are not very successful; but the entremeses are brilliant little pictures of commonplace life. The volume contains also an interesting prologue setting forth Cervantes' own ideas of the drama and giving, so to say, a reminiscent history of the drama. In the dedicatory epistle to the Conde de Lemos, Cervantes shows that he realized he had not long to live. For more than two years he had been at work on *Pérsiles y Sigismunda*, and despite failing health he was able to finish it. On April 18, 1616, Extreme Unction was administered to him, and on the following day, making a supreme effort, he smilingly penned his moving valedictory dedication of this his last work to the Count of Lemos, adapting for his purpose the opening lines of certain coplas antiguas:

"Puesto ya el pie en el estribo,
Con las ansias de la muerte,
Gran Señor, esta te escribo."

Four days later, on April 23, 1616, Cervantes joined the great majority.

Bibliography. Of the many editions of *Don Quixote*, the following deserve special mention: The first edition (first part, Madrid, 1605; second part, Madrid, 1615); facsimile reproductions of these two by the Hispanic Society (New York, n. d.), together with a facsimile reproduction of another Madrid 1605 edition of the first part; that by Juan Antonio Pellicer in 5 vols. (Madrid, 1797); that by Diego Clemencin in 6 vols. with commentary (Madrid, 1833-39); a critical edition by J. Fitzmaurice-Kelly and J. Ormsby in 2 vols. (London, 1898-99); a critical edition by Clemente Cortejón, and continued by Juan Givanel Mas and Juan Suñé Benajes, with commentary (6 vols. have already appeared, Madrid, 1905, 1906, 1907, 1909, 1911, 1913); an edition meant for scientific vulgarization, with commentary, by Francisco Rodríguez Marín (in *Clásicos Castellanos*, 8 vols., Madrid, 1911-13); and a critical edition by R. Foulché-Delbosc, in 4 vols., in press. A critical reproduction of the Tarragona 1614 edition of Avellaneda's spurious Second Part of *Don Quixote* appeared, with a prologue by Marcelino Menéndez y Pelayo, at Barcelona, 1905. The earliest English version of *Don Quixote* (which is also the earliest complete translation of it into any foreign language) is that of Thomas Shelton (part i, London, 1612; part ii, London, 1620), which was reprinted, with an introduction by J. Fitzmaurice-Kelly, in the "Tudor Translations" (4 vols., London, 1896). Other English renderings deserving of mention are those by Jervas (1742), Smollett (1755), Duffield (1881), and Watts (1888); but the best

of all English translations is that by John Ormsby (1885), which has been reprinted with critical introduction and notes by J. Fitzmaurice-Kelly as vols. iii-vi (Glasgow, 1901) of his edition of the *Complete Works of Miguel de Cervantes Saavedra*. For the complete works of Cervantes the chief edition is the *Obras Completas*, ed. by J. E. Hartzenbusch in 12 vols. (Madrid, 1863-64). There is also an edition of the *Obras* (without the plays), which appeared as vol. i of the *Biblioteca de Autores Españoles* (Madrid, 1846). The dramas and farces appeared alone in the *Biblioteca Clásica*, under the title "Teatro Completo" (3 vols., Madrid, 1896-97). The complete works are appearing also in English (at Glasgow, 1901-), under the general editorship of James Fitzmaurice-Kelly, who furnishes the critical introductions and notes. The translation will be complete in 12 vols.; there have already appeared vol. ii, *Galatea*, by Oelsner and Welford, 1903; vols. iii-vi, *Don Quijote*, by Ormsby, 1901; vols. vii-viii, *Exemplary Novels*, by N. Maccoll, 1902. For a history of the biography of Cervantes through the varying degrees of uncertainty that have attended our knowledge of that subject, one should consult the accounts written by Mayans y Siscar (London, 1737-38), Pellicer (1778), Ríos (1780), Pellicer again (1797-98), Fernández de Navarrete (1819), who carefully collated all the available evidence and gave the first biography that was recognized as authoritative. It is the source of all the subsequent biographies published in many languages during the nineteenth century. Additional information concerning obscure points in Cervantes' life were supplied by Travadillo, Morán, Máinez, Asensio y Toledo, Sigüenza, and others. Everything that had previously appeared was utilized by Fitzmaurice-Kelly in his *Life of Cervantes* (1892). In 1897 and 1902 Pérez Pastor (*Documentos cervantinos hasta ahora inéditos*) published 161 new documents about Cervantes, making imperative a new life of the author. Except for the history of the biography of Cervantes, all these earlier accounts are now useless, for we have a work based on all the documentary evidence so far adduced: Fitzmaurice-Kelly, *Miguel de Cervantes Saavedra: A Memoir* (Oxford, 1913). For an exhaustive bibliography concerning Cervantes' works, see Leopoldo Ríos, *Bibliografía crítica de las obras de Miguel de Cervantes Saavedra* (3 vols., Madrid, 1895, 1899, 1905). Since the appearance thereof, the following important studies and editions have been made: Puyol y Alonso, *Estado social que refleja el Quijote* (Madrid, 1905); Salcedo Ruiz, *Estado social que refleja el Quijote* (Madrid, 1905); Givanel Mas, *Examen de Ingenios*, vol. i (deals with commentaries on *Don Quijote*, Madrid, 1912); Romero Quiñones, *Psicología del poema . . . Don Quijote de la Mancha* (Madrid, 1912); Rodríguez Marín, *El "Quijote" y Don Quijote en América* (Madrid, 1911); *Rinconete y Cortadillo* (critical edition by Rodríguez Marín, Sevilla, 1905); *La Tía fingida* (critical study and text by Apráiz, Madrid, 1906); *La Tía fingida* (ed. by Bonilla y San Martín, Madrid, 1911); *El casamiento engañoso and El coloquio de los perros* (critical annotated editions by Amezúa y Mayo, Madrid, 1912); *El Viscaino fingido* (a critical study by Manuel José García, Madrid, 1905); Hazañas y la Rua, *Los Rufianes de Cervantes* (texts, preliminary study, and notes, Sevilla, 1906); Fitzmaurice-Kelly, *Cervantes in England*

(London, 1905); Cotarelo y Mori, *Efemérides Cervantinas* (Madrid, 1905).

CERVERA Y TOPETE, thër-vä'rä ä tö-pä'tä, PASCUAL, CONDE DE JEREZ, MARQUÉS DE SANTA ANNA (1839-1909). A Spanish admiral, born in Jerez, in the Province of Cadiz. His father was one of the wealthiest wine merchants of Spain; his mother a daughter of Count Topete y Velle, a member of the royal family. Cervera was educated at San Fernando (1848-51), and after his graduation served on several training ships. He distinguished himself during the campaign against Morocco in 1859 and was appointed a first lieutenant. He was a member of the Spanish expedition against Cochín China in 1862 and afterward was appointed attaché of the Spanish Legation at Washington. Subsequently he was promoted to the rank of captain and was put in command of a vessel sent to Peru during the War of 1866. Upon the outbreak of the Ten Years' War in Cuba (1868-78) he was engaged in the blockade of Cuban ports, but was recalled by the government and appointed Secretary of the Navy in the Spanish cabinet. He was advanced to the rank of admiral, and soon thereafter placed in command of the *Pelayo*, the original first-class battleship of the Spanish navy. He was next appointed adjutant to the Queen Regent, and was made chief of the Spanish commission sent to the European Naval Conference held in London in 1891.

Upon the outbreak of the Spanish-American War he was placed in command of the squadron sent to America, consisting of the cruisers *Infanta María Teresa*, *Cristóbal Colon*, *Almirante Oquendo*, and *Vicaya*, and the torpedo-boat destroyers *Terror*, *Furor*, and *Pluton*. The fleet left Cadiz April 8 and the Cape Verde Islands April 29. From this latter date Cervera eluded the American fleet, and his whereabouts caused much apprehension, especially in the cities along the Atlantic coast. He had shaped his course for Cuba, however, and about May 19 his squadron entered the harbor at Santiago, where it was blockaded by American vessels under the command of Admiral Sampson. On July 3—by the express orders of his government, it is said—Cervera made a bold dash from the harbor and gave battle to the American vessels; but in the running fight which ensued his fleet was destroyed and he was taken prisoner by Lieutenant Wainwright of the *Gloucester*. By reason of his exceptional bravery, his courteous and dignified bearing, and his generous conduct towards Lieutenant Hobson, he was made the object of much official and popular courtesy. Immediately after the battle President McKinley gave him permission to communicate with his family by cable, and he received many other personal attentions. On July 10 he was taken to Portsmouth, and thence to Annapolis (July 16). With the members of his staff he sailed for Spain on Sept. 12, 1898, and arrived at Santander September 21. Upon his return to Spain he was subjected to court-martial, a procedure usual in European countries, in order that all the facts relative to a defeat or other disaster may be fully known, and the blame or reason for such defeat or disaster fairly placed. He was acquitted and liberated July 7, 1899. Consult *Spanish American War . . . Documents Relative to the Squadron Operations in the West Indies* (trans. from the Spanish, Washington, 1899) and Cervera y Topete, *Views Regarding the Spanish Navy in the Late War* (Washington, 1898).

CERVÉTRI, chér-vā'trē (the name is corrupted from *Cære Vetus*, Old Cære). A village on the site of ancient Cære, in south Etruria, near the Tyrrhenian Sea, in the District of Civita Vecchia, 20 miles northwest of Rome. The ancient town, which was said to have borne the name Agylla before the Etruscan conquest, became one of the 12 Etruscan cities. According to Roman tradition, it afforded refuge to the Tarquins after their expulsion from Rome, and was by the Romans chosen as the safest hiding place for the Vestals and the sacred treasures during the occupation of the capital by the Gauls (c.390 B.C.). Under the Republic and Empire the city continued to exist, but later steadily declined, and about 1250 was deserted by a large portion of its inhabitants, who removed to the present village of Ceri (Cære Novum). As Cære was said to be the first city admitted to the Roman state as a *municipium sine suffragio*, i.e., a *municipium* without the right of suffrage (c.350 B.C.), the name "Cærites" became typical for citizens of such *municipia*. Near the ancient city have been found a large number of fine Etruscan chamber tombs, many richly decorated with paintings and reliefs. The most famous are the Regolini-Galassi tomb, which yielded in 1836 many gold ornaments, arms, a chariot, etc., of the seventh century B.C., and the tomb of the Tarcna, the Etruscan name which the Romans transferred to Latin as Tarquinii. In 1886 many votive terra cottas, representing in part deities, in part portraits of the human body, were found near Ceri. Consult Dennis, *Cities and Cemeteries of Etruria*, vol. i (rev. ed., London, 1907). See **ETRURIA**, and authorities cited there.

CERVIA, chér-vé-ā. A city in the Province of Ravenna, north Italy, 13 miles southeast of Ravenna, on the Adriatic (Map: Italy, G 3). It has a beautiful cathedral and a theatre, and markets salt from the lagoons east of the town. Pop., 1901, 7942; 1911, 9563.

CERVIDÆ (Neo-Lat., from Lat. *cervus*, stag). That family of ruminants which embraces all the deer. (For characteristics, see **DEER**.) It is subdivided into musk deer (*Moschus*) and true deer (*Cervinae*), the latter including many genera, described under **BROCKET**; **DEER**; **ELK**; **GUEMAL**; **MUNTJAC**; **REINDEER**; or under individual names, as **MOOSE**; **SAMBAR**; **WAPITI**. For classification of genera and species, consult Brooke, in *Proceedings Zoological Society of London* (London, 1878, illustrated), and Lydekker, *Deer of All Lands* (London, 1898).

CERVIN, sēr-vān', MONT. See **MATTERHORN**. **CERVUS**. See **DEER**; **ELK**.

CESALPINO, chā-zāl-pē'nō, ANDREA (Lat. *CÆSALPINUS*) (1519-1603). An Italian botanist and physiologist. He was born in Arezzo, Tuscany, studied at the University of Pisa, and for many years was professor of botany there. Thence he was summoned to Rome in 1592 to become physician in ordinary to Pope Clement VIII and professor of medicine at the Sapienza College. He published a work of metaphysical speculation, *Quæstiones Peripateticæ* (1571), based on Aristotle. In his *Katoptron, sive Speculum Artis Medicæ Hippocraticum* (1601), he repeated what Galen and Servetus had said of the circulation of the blood, and there seems no reason for taking the honor of the actual discovery from William Harvey. His *De Plantis* (1583) presented the first botan-

ical system philosophically constructed according to a natural order of classification. Linnæus was considerably indebted to him.

CESANA, chā-zā'nā, GIUSEPPE AUGUSTO (1821-1903). An Italian journalist, born in Milan, founder at Turin of the *Espero* (1854), *Il Pasquino* (1856), the *Corriere italiano* (1865), and the old *Fanfulla* (1870), and editor (1888-93) of *L'Italie* of Rome. He wrote under the name of Tommaso Canella, the title of one of his novels, adopted also by his son Luigi Cesana, editor of the *Messaggero* till his retirement in 1905.

CESARI, chā-zā-rē, ANTONIO (1760-1828). An Italian philologist, born in Verona. He is known by his attempt to restore to Italian the purity of the Renaissance and for his championship of the Tuscan dialect. His monumental edition of the *Vocabolario della Crusca* was published in 1806-09, and his other works include *Alcune novelle* (1810), *Bellezze della Commedia di Dante* (1824-26).

CESARI, GIUSEPPE, CAVALIERE D'ARPINO (c.1568-1640). An Italian painter. He was born in Rome and at the age of 17 was associated with the group of painters charged by Gregory XIII with the decoration of the Vatican. Of this group Roncalli probably influenced him the most. Cesari is the representative of the "later Mannerists," as distinguished from the Eclectic school, headed by the Carracci, and from the Naturalists, who followed Caravaggio. He acquired great fame and popularity in his day, although his work was criticized even then for its deficiency in color, roughness and carelessness of execution, and too great daring. He executed commissions for five popes and many princely families in Rome and Naples, and for Cardinal Richelieu in Paris. His best works include the frescoes of the Olgiati Chapel in Santa Prassede (1591); the gigantic "Ascension" in St. John Lateran; cartoons for the mosaics in the dome of St. Peter's; frescoes in the Borghese Chapel, Santa Maria Maggiore; and frescoes in the Capitol. His smaller pictures are in all the galleries of Europe.

CESAROTTI, chā-zā-rōt'tē, MELCHIORE (1730-1808). An Italian poet. He was born and educated in Padua, where, at an early age, he won an appointment to teach rhetoric in the university, and in 1768 the chair of Greek and Hebrew. A great admirer of France, he wrote an adulatory poem, "Pronœa," in praise of Napoleon, who gave him a pension and later made him Knight and then Commander of the Iron Crown. The influence of French culture is dominant in his reworkings of the *Iliad* and other classics. A reactionary in this respect, Cesarotti became a powerful influence towards freedom of expression in his translation and commentary on Macpherson's *Ossian*, which owed its great vogue in Italy to the novelty of its mingled chivalry and sentimentalism, and visibly affected the style of Alfieri, Monti, Foscolo, and other writers of the younger generation. Consult: Alemanni, *Un filosofo delle lettere* (Turin, 1894); ed. of selected works by Mazzoni (Bologna, 1882; complete works, Pisa-Florence, 1800-13).

CESENA, chā-zā'nā. A city in the Province of Forlì, central Italy, 52 miles southeast of Bologna (Map: Italy, G 3). It is situated on the Savio and has a lyceum, a gymnasium, a technical school, and a seminary. The cathedral contains two fine marble fifteenth and sixteenth century altars, and the handsome city hall has

a colossal statue of Pius VI, who, like his successor, Pius VII, was born here. In the library (founded in 1452 by Domenico Malatesta Novello) are valuable manuscripts, many of which were used by Aldus Manutius. On a hill near the town is the church of Santa Maria del Monte, attributed to Bramante. Cesena markets hemp, wine, vegetables, silk, and refined sulphur. It was already famous for its wines in Roman times. In the Middle Ages it became subject to the Ghibelline family of Montefeltro, then to the Guelph family of Malatesta (see Dante, *Inferno*, xxvii, 53), and afterward it was seized by Cesare Borgia and incorporated with the papal territory. Pop., 1901, 42,240; 1911, 46,445.

CESNOLA, chēs'nō-lā, LUIGI PALMA DI (1832-1904). An Italo-American archaeologist. He was born near Turin, was educated at the Royal Military Academy there, and served in the Sardinian army against Austria in 1849, and as staff officer in the Crimean War. He came to New York in 1860, where he engaged in teaching languages. In the Civil War, as colonel of the Fourth New York Cavalry, he took part in many engagements until June, 1863, when he was wounded and taken prisoner. At the close of the war he was brevetted brigadier general, was naturalized, and served as Consul at Cyprus (1865-77). He made a valuable archaeological collection, which in 1873 became the property of the Metropolitan Museum of Art, New York. In 1879 he was appointed director of that institution. The following year his collections were the subject of a long and bitter controversy, their genuineness being questioned by art critics, but in the end his work was generally accepted as trustworthy. He published *Cyprus: Its Ancient Cities, Tombs, and Temples* (1878); *Descriptive Atlas of the Cesnola Collection of Cypriote Antiquities* (1884-86); *The Metropolitan Museum of Art* (1882); and numerous pamphlets on art subjects.

CÉSPEDES, thās'pā-dās, PABLO DE (1538-1608). A Spanish painter and man of letters. He was born in Córdoba, of a noble Castilian family, and studied painting in Rome under Cesar de Arbasia, and later was associated there with Federico Zuccaro. In 1577 he was made a canon of the cathedral of Córdoba, where his principal works are found. The best of these is "The Last Supper." He is a somewhat tiresome and affected painter, who studiously avoided a natural treatment of his subject. He wrote several works on art, including a poem on painting (1604). Consult his biography by Tubino (Madrid, 1868).

CÉSPEDES Y BORGES, thās'pā-dās ē bōr'-hās, CARLOS MANUEL DE (1819-74). A Cuban poet and patriot. He was born at Bayamo, in the Province of Santiago de Cuba, and studied at the universities of Havana, Barcelona, and Madrid. In Spain he became involved with Prim in a conspiracy to overthrow the government and was compelled to flee. After traveling for some time on the Continent, he returned to Cuba and began the practice of law, publishing at the same time a play (*Las dos Dianas*) and minor poetical pieces. As early as 1852 he suffered imprisonment for his revolutionary sentiments, and he was the leader of the revolt which broke out in 1868. On Oct. 10, 1868, he proclaimed the independence of Cuba at Yara, and, with an army of some thousands, took possession of Bayamo. In January, 1869, he was

forced to retreat to Guaimaro, where the republic was formally organized, April 10, 1869, and he was elected President. After 1870 his popularity waned rapidly, and in 1873 he was deposed by the Cuban Congress. He perished the next year; whether slain by his own servant or Spanish soldiers is uncertain. For an entertaining novelistic, but not wholly reliable account of his deeds, consult Piron, *L'Île de Cuba* (Paris, 1876); and for greater light on certain phases of his life, V. García Verdugo, *Cuba contra España* (Madrid, 1869); F. J. Cisneros, *La Verdad histórica sobre sucesos de Cuba* (New York, 1871); A. Zambrana, *La República de Cuba* (New York, 1875); Capt. Joseph Fry, *Historia de la insurrección de Cuba* (New Orleans, 1877).

CESS. See LAND TAX.

CES/SIO BONO/RUM (Lat., surrender of goods). In the Roman law and under the modern systems derived from it, a process of voluntary bankruptcy whereby the debtor is permitted to escape the more painful personal and public consequences of insolvency by making a full and free surrender of all his goods or of all his property, real and personal. In the Roman law the consequences thus averted were comprehended under the term "infamia" (*infamia*), by which was meant the loss of certain civil rights—as the capacity to hold office, to act as guardian or trustee, and the like. In the Scottish law a *cessio bonorum* operates to relieve the debtor from the liability to arrest and imprisonment for debt. This indulgence is granted upon petition by the debtor setting forth the fact of his insolvency and his willingness to surrender his property to his creditors. If it appear, on hearing, that the indebtedness is legitimate and the application free from fraud, a decree of *cessio bonorum* is made, and this operates as an assignment of the debtor's estate to a trustee for the benefit of the creditors at large. As a general thing, a *cessio bonorum* does not, however, operate, like a decree in bankruptcy, to absolve the debtor from his liabilities, but is analogous in its results to the proceedings in insolvency common to most of the United States. See BANKRUPTCY; INSOLVENCY.

CESSION (Lat. *cessio*, surrender, from *cedere*, to yield). In international law, the formal transfer of territory by one state to another. It may be the result of a gift, or of a sale, or of the fortunes of war. Most cessions have been forced from the ceding states as conditions of peace. The effect of a cession of territory upon the civil and political rights of the inhabitants of the ceded territory is generally determined by the treaty under which the transfer is made. In the absence of special stipulations on the subject, the inhabitants of the ceded territory change their allegiance from one sovereignty to another as soon as the transfer is complete; but the old laws continue in force until abrogated or changed by the new sovereign. The relations of the people to each other and their titles to property are not affected by the cession. A state which is forced to cede a part of its territory is not bound to indemnify its citizens who may suffer a loss of property by the cession. See CONQUEST. Consult Lawrence, *Principles of International Law* (3d ed., Boston, 1900), and Kent, *Commentaries on American Law* (12th ed., Boston, 1873).

CESS/POOL (more correctly, *sess*; dialectic

Eng. *suss*, *soss*, puddle, from Gael. *sos*, coarse mixture). A well or pit, often inclosed by masonry or wood, for the reception of sewage and drainage from dwellings. Cesspools should be made water-tight and emptied at stated intervals. Sometimes, however, they are connected with a blind drain through which the liquid will soak into the soil. A sink hole, or leaching cesspool, has its bottom or sides so constructed that the contents soak readily into the soil.

CESTI, chās'té, MARC' ANTONIO (1620-69). An Italian dramatic composer, born in Arezzo. He studied under Carissimi and became *maestro di cappella* to Ferdinand II and assistant kapellmeister to the Emperor Leopold I. His operas were uniformly successful, but only *La Dori* (1663) and *Il pomo d'oro* (1666) have come down to us. A number of his cantatas have been preserved, but they are important chiefly for having been the first cantatas performed on the stage. He died in Venice.

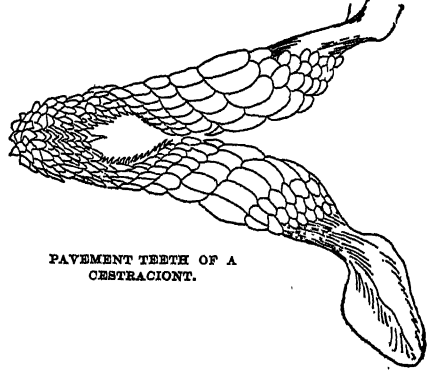
CESTIAN BRIDGE, sēs'chan. An ancient bridge at Rome joining the island of Æsculapius with the Trastevere, or Janiculum bank of the Tiber. It was built by Lucius Cestius, a prefect of the city, in 46 B.C., and restored by the Emperor Gratianus in 370 with material taken from the Theatre of Marcellus. Two modern arches were added when the bed of the river was widened in 1889; the middle arch dates from Gratianus' time. It is now called the Ponte di San Bartolomeo, from the neighboring church of that name.

CESTIUS, PYRAMID OF. A Roman tomb of the Augustan age, near the Porta San Paolo, Rome. It is a unique imitation of Egyptian models. The exterior form is perfectly preserved, the pyramid rising 116 feet from a base 96 feet square. It is built of concrete, faced with slabs of white marble, and rests on a base of travertine. In the centre is a small sepulchral chamber whose surface of stucco was decorated with paintings of female figures and ornamental scrolls, quite perfect when the tomb was discovered and opened in 1663. The name and circumstances of Gaius Cestius, who was buried here, are given in inscriptions, but he is otherwise unknown.

CESTODA (Neo-Lat., variant of *Cestoidea*, from Gk. *kestrós*, *kestrós*, girdle + *eidós*, *eidós*, form). A subclass of Platyodes (flatworms) consisting of tapeworms and similar endoparasites, without cilia, without intestine, but with numerous testes, ovaries, and one or two yolk glands. Cestodes are very widely distributed, but especially abundant in warm climates. They occur as intestinal parasites in species of all the classes of vertebrates, especially mammals, but the complete life history is known for comparatively few species. The group contains two orders, the Monozoa, unsegmented individuals (rare), and the Polyzoa, segmented tapeworms. For structure, habits, and effects upon the system of the host, see TAPEWORM.

CESTRACIONT, sēs-trá/shi-önt (Neo-Lat., from Neo-Lat. *cestracion*, from Gk. *kestrá*, *kestrá*, weapon, from *kestréiv*, *kentein*, to prick). A shark of the family Heterodontidae, or Cestraciontidae, whose three or four living species are chiefly interesting because they represent the oldest fossil sharks known, whose remains begin to be found in the Devonian, and in the Carboniferous become numerous and of larger size than the existing cestraciont. Thence the race declined somewhat, but may be traced to the

present. They are known as pavement-toothed sharks, because the many teeth in the back of the mouth have a pavement-like arrangement. The surviving species are confined to the warmer parts of the Pacific Ocean and are known as Port Jackson sharks. None exceed 5 feet in length, and they are distinguished by having



PAVEMENT TEETH OF A
CESTRACIONT.

two dorsal fins, in front of each of which is a strong, sharp spine, now smooth, but in fossil forms variously sculptured. The best-known species is the nurse shark (*Heterodontus*, or *Cestracion philippi*). Little is known of their habits, but they are believed to subsist mainly on mollusks, whose shells are crushed between the "pavements" of teeth. See NURSE SHARK; PORT JACKSON SHARK; and Colored Plate of FISHES OF THE PHILIPPINES, accompanying the article PHILIPPINE ISLANDS.

CESTROTUM (Lat., from Gk. *kestron*, *kestron*, graving tool, from *kestréiv*, *kentein*, to prick). A species of encaustic painting (q.v.) on horn or ivory, the lines of the design being burned in with the *cestrum*, or burning needle, and wax introduced in the furrows thus made.

CESTRUM (Lat., from Gk. *kestron*, *kestron*, graving tool, from *kestréiv*, *kentein*, to prick). The implement, or spatula, employed by the ancients in encaustic painting. The *cestrum* was made of metal, one end pointed, the other end flat. See ENCAUSTIC PAINTING.

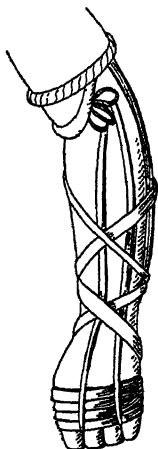
CESTUI QUE TRUST, sēs'twé ke or sēt'wé (OF., he for whom the trust). The technical legal term for the one for whose benefit a trust exists; the person who has the beneficial interest, as distinguished from the legal estate in lands or goods; the beneficiary of a trust. Cf. CESTUI QUE USE, and see TRUST.

CESTUI QUE USE (OF., he for whom the use). In English law, the person to whose use —i.e., for whose benefit—another holds the fee of lands or tenements. The term is nearly identical in meaning with the modern term *cestui que trust* (q.v.), and will be more fully explained under USES and TRUST.

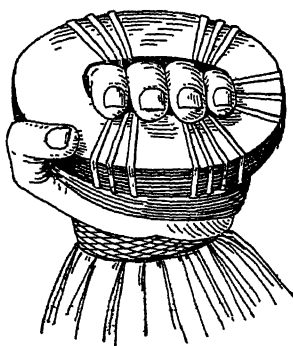
CESTUI QUE VIE, vē (OF., he for whose life). In the English and American law of real property, a person whose life is the measure of the duration of an estate. A life estate, which was the characteristic estate of the early feudal law and is still of common occurrence, may be granted to one for his own life, or for the life of another, or even for the lives of several others. Thus, if a man by his last will devises lands to his daughter to have and to hold dur-

ing the life of the mother, the latter, though having no interest in the estate, is known as the *cestui que vie*. So, also, if a life tenant of an estate for his own life conveys the same to another, he thereby steps into the position of a *cestui que vie*. His life continues to be the measure of the estate, notwithstanding it is now held and enjoyed by another. When the *cestui que vie* dies, the estate comes to an end. See LIFE ESTATE.

CESTUS, or, more correctly, **CAESTUS** (Lat., from *cadere*, to cut, smite, kill). The name of the covering for the hands worn by



CESTUS AS A PROTECTION.



CESTUS AS A WEAPON.

Roman pugilists. Among the Greeks, until about 400 B.C., pugilists wound long bands of soft leather about the fingers and hand to protect them from injury. By degrees this protection became a means of offense, as the leather thongs were made thicker and harder, and finally became a formidable weapon, as is shown, e.g., on the fine bronze statue of a seated pugilist now in the Museo delle Terme in Rome. In still later times the heavy leather thongs were further strengthened by metal bands, or even almost wholly replaced by metal. This dreadful weapon caused serious injury and even death.

CESTUS (Gk. *κεστός*, *kestos*, embroidered, from *κερτείν*, *kentein*, to prick, to broider). In Homer, properly an adjective, epithet of a magic band which Hera borrows from Aphrodite when she is anxious to lure Zeus to her side. Later, the word is used as a noun in the sense of "girdle."

CETACEA, sê-tă'shê-ă (Neo-Lat. nom. pl., from Lat. *cetus*, Gk. *κῆτος*, *kêtos*, whale). An order of aquatic mammals, comprising the whales, dolphins, and porpoises. The members of this order, in becoming more perfectly adapted to an aquatic life, have abandoned the original form and assumed the outward form and much of the external structure of fish. Their bodies are fishlike, with smooth skins. Their pectoral or fore limbs are reduced to paddles that perform the functions of the pectoral fins of fish; their pelvic or hind limbs have disappeared entirely, and the pelvis itself has become reduced to a pair of horizontal bones that are remnants of the ischia. The tail is provided with a horizontal caudal fin, and a posterior dorsal fin is usually present on the back. There are also important modifications in the vertebral column

and skull. The order comprises three suborders: Archæoceti, all extinct animals, with long snouts, forward nostrils, and heterodont teeth; Odontoceti, including several families and about 60 species, comprising the toothed whales, with porpoises, dolphins, belugas, killers, etc., of small size, and the huge sperm whales; and Mystacoceti, with nostrils far back, and their jaws bearing whalebone instead of teeth, as in the whalebone whale. For detailed descriptions and habits, see articles on the different members of the order.

Fossil Cetacea. Fossil forms of the Cetacea are not common, and the evolution of the order cannot be satisfactorily traced. The earliest representative is the genus *Zeuglodon*, the only member of the suborder Archæoceti. This genus appears in the Eocene rocks of Europe, North Africa, and North America, and its skull presents closer resemblances to the normal mammalian skull than are to be found in that of any other cetacean. Its teeth are of two kinds—conical simple incisors and compressed serrated two-rooted molars. In the Miocene rocks are found the earliest Odontoceti, or toothed whales, in which the skull tends to become asymmetrical and the teeth to multiply and become similar and conical; and in the Pliocene all the modern types of this suborder were evolved, although their mode of evolution is not known. In the Miocene there appeared also the earliest-known members of the Mystacoceti, or whalebone whales, which were of much smaller size and which had longer necks than have their modern descendants. The evolution of the Mystacoceti from Odontoceti is indicated by the presence, in the fetal stages of some genera of the former group, of rudimentary calcified teeth which soon drop out to be replaced, in the adult stages, by whalebone. The Tertiary deposits of Patagonia may be looked to for the discovery of interesting material bearing on the evolution of this aberrant group of mammals. See PHYSDON; PORPOISE; DOLPHIN; SQUALODON; WHALE; ZEUGLONDON.

CETEWAYO, kěch-wă'yô. See ZULULAND.

CETHEGUS. The name of a Roman patrician family, of the Cornelia Gens. 1. **MARCUS CORNELIUS CETHEGUS**. Curule ædile, 213 B.C., censor in 209, and consul in 204. In 203, as proconsul in northern Italy, with the prætor P. Quintilius Varus, he defeated Mago, the brother of Hannibal, and compelled him to withdraw from Italy. According to Cicero, *Brutus*, 59, Ennius called Cethegus the *suadæ medulla*, 'the marrow of persuasiveness.' 2. **GAIUS CORNELIUS CETHEGUS**, the most efficient of the associates of Catiline. After Catiline's departure from Rome Cethegus remained in Rome to press the purposes of the conspirators. When he was arrested by Cicero, arms were found in his house. His guilt was further established by a letter which he had given to certain ambassadors of the Allobroges to carry to Catiline on their way home. With other conspirators he was executed, on Cicero's order, on Dec. 5, 63 B.C.

CETINA, thă-tě'nă, GUTIERRE DE (?1518-57). A Spanish lyric poet, born at Seville shortly before 1520. Uncertainty enshrouds most of his life, but we know that he served in the army in Italy, in Tunis, and in Flanders between 1542 and 1547, and won the patronage of the Prince of Ascoli (Antonio de Leyva), of Hurtado de Mendoza, and of the Duke of Sessa. About 1547 (perhaps somewhat earlier) he re-

tired from the army and settled in Seville. Shortly afterward he went to Mexico. How long he remained is not known (conjectures run as high as 10 years). From this point on, accounts of his life vary widely. According to some authorities he entered the Church, took a doctor's degree in theology, and accepted a vicariate in Madrid. Hazañias y la Rúa thinks this version due to a confusion of our author with another person of the same name, who lived a few years later and died in 1578. Other authorities make no mention of such ecclesiastical activities, but state that he seems to have revisited Seville about 1557 and to have returned to Mexico, where he died some time previous to 1575. Cetina's biographer and friend Pacheco says he died in Mexico in 1560. With this date some critics agree, although claiming that he died in Seville. This, too, is due to a confusion with a distinguished Sevillian of the same name who was Regidor de Puerto Real in 1635. Fitzmaurice-Kelly says that Cetina went to Mexico about 1547, revisited (at a date not given) Seville, where he must have written copiously, and finally returned to Mexico, where he died (at Los Angeles) as a result of wounds received by mistake in a nocturnal ambush in 1557. He has been recognized as one of the three patriarchs of Castilian poetry in Mexico, the other two being Cervantes Salazar and Salazar de Alarcón. He belonged to the Italianizing school and wrote in the smaller verse forms. Because of the number of his anacreontic verses he has been called the Spanish Anacreon. He handled the sonnet with even greater mastery than did Garcilasso. For years he was known chiefly for his exquisite madrigal *Ojos claros, serenos*. In 1854, at Madrid, Adolfo de Castro collected what was supposed to be all of his work that was still extant, and published it in vol. xxxii of the *Biblioteca de Autores Españoles*. Gallardo included some previously unpublished burlesques in his *Ensayo de una biblioteca española* (vol. ii, Madrid, 1866). Translations of several pieces are to be found in Hoffmann, *Blüten spanischer Poesie* (3d ed., Magdeburg, 1856). Cetina's works have been well edited, with a critical and biographical study as introduction, by J. Hazañias y la Rúa (2 vols., Seville, 1895). Consult also P. Savi-Lopez, *Un petrarchista spagnuolo* (Trani, 1896).

CETINJE, tsët'ën-yä. The capital of Montenegro and residence of the King and the higher secular and ecclesiastical authorities of the kingdom (Map: Balkan Peninsula, B 3). It is situated at an altitude of nearly 2000 feet, in a deep valley surrounded by mountains. In its general appearance it looks more like a village than the capital of a country. Even the palace of the King is an unpretentious, one-story house. The town has an old monastery, a number of institutions for secondary education, including a girls' institute, and a theatre. The population numbers about 4400. The town was destroyed by the Turks in 1683, 1714, and 1785. Consult Wyon and France, *Land of the Black Mountain* (London, 1903), and Passarge, *Montenegro und sein Herrenhaus* (Berlin, 1906).

CETIOSAURUS. A gigantic fossil reptile of the Dinosaurian family from the Jurassic and Cretaceous strata of Europe. Only fragments of the skeletons have been discovered, but these have been pieced together to give a fair representation of the proportions of the ani-

mal, which probably reached a length of 60 or 70 feet and a height of 10 feet. See DINOSAURIA.

CETOTOLITH (from Gk. κῆτος, *kētos*, whale + *ōs*, *ous*, ear + λίθος, *lithos*, stone). The fossil ear bone of a whale. Cetotoliths are often found in the Tertiary deposits of Europe and North America, and in many parts of these formations they are the only remnants of the skeletons of whales that have been preserved. This is due to their harder consistency, which is greater than that of the rest of the skull and bones. See CETACEA; WHALE.

CETRA'RIA. See ICELAND MOSS.

CETTE, sët. A seaport town and fortress of the third class, in the Department of Hérault, France, on a neck of land between the lagoon of Thau and the Mediterranean, about 25 miles southwest of Montpellier (Map: France, S., H 5). The town is entered by a causeway raised above the Thau lagoon, and a bridge of 52 arches. The main features of its fortifications are the redoubt of Claire and the forts of St. Louis and St. Pierre. The depth of its harbor is from 16 to 19 feet. As a seaport it ranks second to Marseilles among those of the south coast of France. Its broad, deep canal, lined with excellent quays, connects the port with the lagoon of Thau, and so with the Canal du Midi and the Rhône, thus giving to Cette an extensive inland traffic; it has likewise an active foreign commerce. Its trade is in wine, brandy, salt, dyestuffs, perfumery, and verdigris. Cette is primarily a centre for the rectification, packing, and shipping of wines. It has large shipbuilding yards, cooperage works, manufactures of chemicals and perfumes, and fisheries of oysters and anchovies. It is popular as a seaside resort. The port was founded in 1666 by one of the ministers of Louis XIV. Pop. (commune), 1901, 33,246; 1911, 33,049.

CETTIGNE. See CETINJE.

CE'TUS (Lat., from Gk. κῆτος, *kētos*, whale). A southern constellation lying to the south of Aries. Among its stars is a very remarkable variable called α Ceti. It has been named Mira (the wonderful), on account of its extraordinary changes of luminosity. Since 1596, when its variability was first discovered by Fabricius, it has blazed up sufficiently to be visible to the unaided eye once in about 11 months. It usually remains visible a number of days, and then sinks again into the comparative unimportance of a telescopic star of the ninth magnitude.

CEULEN, kē'len, or **KOILEN**, LUDOLPH VAN (1540-1610). A Dutch mathematician, who was born at Hildesheim and died in Holland. He is chiefly known for his computations of the value of π , which he finally carried to 35 decimal places. This value was inscribed on his tombstone in St. Peter's Church in Leyden. The number π is sometimes called the Ludolphian number.

CEUTA, thá'oo-tá. The chief Spanish penal settlement or presidio, on the north coast of Africa, situated on a small promontory in Morocco, about 17 miles south of Gibraltar (Map: Africa, D 1). It is well fortified by a citadel and several batteries on Mount Acho, which with Gibraltar makes the two "pillars of Hercules." It has a cathedral and is the seat of a bishop and administratively belongs to the Province of Cadiz. A prison is in the old convent of San Francisco. Its harbor is small and unprotected. Pop., 1900, 13,843; 1910, 23,907. Ceuta is of Roman origin. It passed in 1415 from the Moors to the Portuguese,

and in 1580 was annexed with all the Portuguese territories to Spain, in whose possession it has since remained. Consult De Prado, *Recuerdos de Africa*; *historia de la plaza de Ceuta* (Madrid, 1859-60), and Budgett Meakin, *The Land of the Moors*, chap. xix (London, 1901).

CEVA, chá'vá, TOMMASO (1648-1736). An Italian mathematician and poet, born in Milan. His *De Natura Gravium* (1669) was the first exposition of Newton's law of gravitation published in Italy. He invented an instrument for the trisection of angles and published valuable investigations in his *Opuscula Mathematica* (1699). His poem *Puer Jesus* (1699; ed. by Broxner, 1842), in epic manner, is of worth.

CEV'ADIL'LA. See SABADILLA.

CEVALLOS, thá-vál'yōs, or **CEBALLOS**, PEDRO (1761-1838). A Spanish politician and diplomat, born in Santander (in the province of that name). He was educated in Valladolid and appointed Secretary to the Embassy in Lisbon. In the confusion incident to Napoleon's interference in Spanish affairs, he took sides with the Crown Prince Ferdinand (afterward Ferdinand VII), whom he advised to arrange the interview with Napoleon at Bayonne. He was afterward a member of the Junta of the Spanish insurgents and acted as agent of that interest in London. In 1808 he published his *Exposition des faits et des trames, qui ont préparé l'occupation de la couronne d'Espagne*, descriptive of Napoleonic methods. He continued prominent during the struggle for independence and was for a time a cabinet minister under Ferdinand VII. He also held posts as Ambassador at Naples and Vienna. In 1820 he retired to private life.

CÉVENNES, sá'ven' (ancient Cebenna). The chief mountain range in the south of France. Divided into two groups, the Northern and Southern Cévennes, they form the watershed between the river system of the Rhône on one side and those of the Garonne and Loire on the other. Their general direction is from northeast to southwest, commencing at the southern extremity of the Lyonnais Mountains, and extending under different local names as far as the Canal du Midi, where they approach the northern offsets of the Pyrenees. The central mass of the Cévennes lies in the departments Lozère and Ardèche, Mont Mézenc (the culminating point of the chain) having an elevation of 5754 feet. The average height is from 3000 to 4000 feet. The masses consist chiefly of amphibolic rocks, graywacke, and limestone, covered with Tertiary formations, which in many places are interrupted by volcanic rocks. The Cévennes have been celebrated as the arena of religious warfare. They were the scene of the persecutions of the Albigenses (q.v.) and the Waldenses (q.v.) in the Middle Ages and of the Camisards (q.v.) in the seventeenth century. Consult R. L. Stevenson, *Travels with a Donkey in the Cévennes* (9th ed., London, 1895), and Ribard, *L'Histoire cévenale d'après des documents* (Cazillac, 1898).

CÉVENOLE (sá've-nól') **RACE**. A term applied by Deniker to the Celtic or Alpine short-headed type of Europeans, also called Occidental. The name is derived from the Cévennes, in France, the locality of its most characteristic type. Consult Deniker, *Races of Man* (London, 1900).

CEYLON, sè-lôn' (Hind. *Silān*, Pali *Sīhalana*, from Skt. *Simhala*, Ceylon, from *simha*, lion; Lat. *Taprobane*, from Gk. *Tamproβάρη*, from Skt. *tamraparna*, copper leaf, on account of the shape of the island, from *tamra*, copper + *parna*, leaf; the Skt. name of the island is *Lankā*). An island in the Indian Ocean, and a crown colony of Great Britain, situated about 60 miles southeast of the Indian peninsula, from which it is separated by Palk Strait and the Gulf of Manar (Map: India, D 7). Its location is between lat. 5° 55' and 9° 51' N., and between long. 79° 41' and 81° 54' E. It is almost pear-shaped, having a length of about 266 miles and a width varying from 32 to 140 miles, with a total area of over 25,300 square miles.

Physical Features. In its northern part Ceylon is a level country, interspersed here and there with low hill chains. The southern part, on the contrary, is mountainous in its character. The mountain masses of the island cover an area of over 4000 square miles and run in various directions with a gradual decline towards the north. The highest peaks are Pedrotallagalla (8280 feet) and Adam's Peak (7420 feet), a famous place of pilgrimage among Oriental nations and especially held in high esteem by the Buddhists. Other peaks are Tolapella (7720 feet) and Kirrigalpota (7810 feet). Geologically the northern part of Ceylon shows a predominance of coral limestone, while the prevailing composition of the mountains is gneiss occasionally intersected with veins of quartz and sometimes overlaid with clay or limestone. Ceylon has numerous rivers, mostly dependent on the rains for their water. The principal of them is the Mahavela-ganga, rising in the mountains in the vicinity of Adam's Peak and falling into the ocean near Trincomalee Bay. It has a course 134 miles long, drains upward of 4000 square miles, and is abundantly timbered on its banks with halmalille, ebony, satinwood, etc. It is quite deep and even navigable for a short distance during the rainy season, but is easily forded in the dry season. There are ancient remains of dams and canals which formerly connected extensive lagoons along the east coast.

The climate of Ceylon, although superior to that of most tropical countries, is still sufficiently unhealthful, especially in the low regions, to prevent European immigration on a large scale. In some parts of the island there is practically only one season, a humid and oppressive heat interrupted now and then by copious showers. The average annual temperature ranges from about 70° to 90°, in accordance with the altitude of the locality. In the mountains the temperature is pleasantly cool and not infrequently cold in the night. In the valley of Nurwara-Eliya, situated at an altitude of nearly 6000 feet and used for a sanatorium, the temperature seldom rises above 70° and has an annual average of about 62°. The rainfall shows as much diversity as the temperature, ranging from 30 to 80 and sometimes 120 inches per year.

The flora of Ceylon is remarkable for its beauty as well as for its variety and constitutes one of the principal attractions of the island. It is especially rich in palms, of which the most prominent specimens are the coconut, areca, and feathery palms. The elevated portions of the island were formerly covered with thick forests

of valuable trees, some of which cannot be found elsewhere in the world. Most of these forests are being destroyed to make way for the extensive tea plantations, which now constitute the most prominent feature of the island. Ceylon is also especially rich in ferns and flowers, of which there are endless varieties.

The animal kingdom of Ceylon is also remarkable for its variety. Chief among the quadrupeds is the elephant, which, although tuskless, is of much value as a beast of burden and is largely exported from the island. The bear, leopard, buffalo, several species of the monkey, and the Indian humped ox are also abundant. The island contains over 3000 species of birds and many varieties of reptiles, among which the most prominent is the crocodile.

Agriculture is the chief industry of Ceylon as well as the main source of its prosperity. About one-fourth of the total area (16,307,940 acres) is in crops and pastures. The acreage in 1912 under main crops follows: 942,621 acres under coconuts; 680,574 under rice and 101,708 under other grains; 580,845 under tea; 215,000 under rubber; 47,292 under cinnamon; 43,358 under cacao; 16,241 under tobacco; 1512 under coffee; 263 under cinchona. Upon the decline of the coffee industry in the island during the later years of the nineteenth century European enterprise established tea plantations, which developed rapidly and rendered remarkable returns, as shown by comparative export figures: 2,392,963 pounds in 1884; 7,849,888 in 1886; 23,820,471 in 1888; 45,799,518 in 1890; 149,264,602 in 1900; 182,070,094 in 1910; 186,594,055 in 1911. On the tea estates in 1911 there were about 440,000 Indian coolies. The price of tea having fallen, the planters began the development of the rubber industry. In 1898 only about 750 acres were under rubber; in 1901 there were 2500; 11,000 in 1904; 40,000 in 1905; 100,000 in 1906; 150,000 in 1907; 186,634 in 1910; 215,000 in 1911. Ceylon rubber is chiefly of the Para variety, contains 94 to 95 per cent caoutchouc, and loses only 1 per cent in washing. Owing to the reluctance of the Singhalese to work on the plantations (a reluctance due partly to their satisfaction with their present condition and partly to their mistrust of foreigners), the planters depend for their labor on imported coolies, who come over to the island with their families and after a stay of several years generally return to India. The estimated number of laborers on plantations, including natives born of coolie parents, was 510,000 in 1912.

Ceylon is famous for its precious stones—rubies, sapphires, moonstones, etc. The gem quarries in operation in 1912 numbered 1886. The pearl fisheries, near Manar, were leased, Jan. 1, 1906, to an English company for 20 years, conditional upon the expenditure of stipulated sums for improvements; this lease was later terminated and control of the banks resumed by the government. They yielded a revenue of Rs.2,405,645 in 1905. The manufacture of salt is a government monopoly. Plumbago mines and pits numbered 609 in 1912, yielding, in 1910, 632,275 hundredweight (est.), valued at about Rs.9,484,125.

Commerce. Trade development during the decade 1902–12 is shown in the following figures: Rs.109,468,265 imports and 99,402,890 exports in 1902; 116,483,243 and 104,265,926 in 1904; 129,316,757 and 129,570,001 in 1907,

the first year in which the export value approximately equaled the import value; 133,782,127 and 146,899,631 in 1909; 164,405,788 and 182,028,968 in 1911; 181,999,991 and 198,954,902 in 1912. The wide swing from an unfavorable to a favorable balance of trade during the decade is noteworthy. Export of tea in 1911, Rs.84,900,300; rubber, Rs.36,427,290; coconut-palm products, Rs.38,086,242; plumbago, Rs.6,656,310; areca nuts, Rs.2,423,010; cacao, Rs.2,370,773; cinnamon, Rs.2,086,293. Of the total exports, those to the United Kingdom were valued at Rs.87,359,604 and to British possessions at Rs.25,492,383. Of the total imports, those from the United Kingdom were valued at Rs.43,443,786 and those from British possessions at Rs.100,095,273. Rice valued at Rs.45,409,525 came from India; from the United Kingdom the chief imports are textiles and coal. Colombo, the capital (213,396 inhabitants in 1911), Galle (40,187), and Trincomalee (9086) are important ports. The total tonnage entered and cleared in 1911 was 14,026,764, of which 9,571,159 tons were British; in 1902 the total tonnage was 9,955,256, of which 6,947,898 tons were British. The total railway mileage in operation was 603½ in 1912, all government owned and worked. Under construction there were 131 miles.

Administration. Ceylon has been administered since 1831 by a governor; he is assisted by an executive council of seven members and a legislative council of 21 members, including the ex-officio members of the executive council, the government agents for the Western, Central, and Southern provinces, the (principal) medical and one other officers, together with six nominated and four elected nonofficeholding members. For administrative purposes Ceylon is divided into nine provinces, each administered by a government agent. The code of the colony is a modification of the Roman-Dutch law, while the criminal law is based on the Indian Penal Code. Justice is administered by a supreme court, police and district courts, and courts of requests. Minor cases are dealt with by the village councils. The revenue and expenditure in 1911–12 were Rs.47,264,222 and Rs.48,643,687 respectively. The chief sources of revenue are customs duties, licenses, monopolies, stamps, land sales, and railways. The chief items of expenditure are administration, public works, service of the debt, military forces, fortifications, and pensions. The foreign public debt amounted, June 30, 1912, to Rs.92,073,409. Public instruction is in charge of a special department presided over by a director assisted by a staff of inspectors. The total attendance at government schools at the end of 1911 was 104,000; at government-aided schools, 222,000; at unaided schools, 34,375. Among the educational establishments of the island there are several high schools, one technical and one normal college, and a number of industrial schools.

Inhabitants. The total population, according to the census of March 10, 1911, inclusive of military, shipping, and estates, was 4,110,367 (an increase of 14.9 per cent over the returns of the census of 1901), detailed as follows: 8524 Europeans, 26,673 burghers and Eurasians, 2,715,686 Singhalese, 1,060,167 Tamils, 267,054 "Moors" (non-Malay Mohammedans), 12,992 Malays; others, 19,271. The Singhalese, who inhabit chiefly the Southern and Central divisions, are the descendants of colonists from the valley of the Ganges who first settled on

the island during the fifth century B.C. In their customs, costume, and general appearance they have remained unchanged since the days of Ptolemy. The dress of the men, who have delicate features and slender limbs, is singularly effeminate and consists of a comboy, fastened at the waist and hanging straight to the ankles, while a jacket of white linen or duck covers the upper part of the body. Their long hair, turned back from the forehead, is confined with combs, and earrings are worn by way of ornament. The women, in addition to the comboy, cover the upper part of the figure with a white muslin jacket, and adorn themselves with necklaces, bangles, rings, and jewelry. The Singhalese are Aryans by language, but in blood they are somewhat mixed, though fundamentally of the white race. The Kandians, or Highlanders, are a sturdy race and maintained their independence for centuries after the conquest of the low country by European settlers. They keep up more of their ancient customs than the coast Singhalese. Polyandry, which was formerly universal, still lingers among them, and is an ancient usage to which they strongly adhere. The Malabars, or Tamils, are Dravidians and sprung from those early invaders of Ceylon who from time to time swept across from southern India and contended with the Singhalese kings for the sovereignty. The Moormen, so called by the Portuguese, are the most energetic and intelligent of the native communities and are met with in every province as enterprising traders. They are a very distinct race from the Singhalese, but have no tradition of their origin. Europeans generally believe them to be of Arab descent, but Tennent is of the opinion that "they may be a remnant of the Persians, by whom the island was frequented in the fourth and fifth centuries." The Tamils are largely devotees of Hinduism, while the Singhalese are Buddhists; Ceylonese Buddhism, indeed, is the most vigorous branch of that faith.

The burghers are a people of European descent who have become naturalized. Those of Portuguese extraction hold the lowest place and are mostly tradesmen and artisans; but the Dutch burghers frequently fill responsible posts and are employed in government offices.

The aboriginal inhabitants of the country are the Veddas, a remarkable people representing one of the most primitive stages in human culture at the present time. They number over 5000 and occupy a district in the eastern part of the island, where they have preserved their ancient customs and manner of living for several thousand years. They are divided into the coast Veddas, rock Veddas, and village Veddas. The coast Veddas are a little more civilized than the others. The rock Veddas hide themselves in the jungle, live by the chase, and sleep in trees or caves. They use fire to cook their meat, and their greatest gastronomic treats are the iguana lizard and roasted monkey. The village Veddas locate themselves in the vicinity of European settlements on the eastern coast, living in rude huts of mud and bark, and are hardly more civilized than their brethren of the jungles. The exertions of the government to reclaim this people have been somewhat successful. The recent researches of the Sarains and of the Seligmans have revealed many important facts concerning the sociology, language (Singhalese influences), religion (Indian

influences apparent in places), and folklore of the Veddas. Their "arrow dances" and songs are of especial interest. (See for details, Seligmann, *The Veddas*, Cambridge, 1911.) The Veddas may be regarded as remnants of a pre-Dravidian race, cognate, perhaps, with such other very primitive and isolated peoples as the Toala of Celebes, the Batin of Sumatra, etc. See VEDDAS.

Language and Literature. The Ceylonese, Singhalese, or Sinhalese is a modern Indian dialect spoken in the south of Ceylon, while a Dravidian dialect, the Tamil, is the language of the northern part of the island. The Singhalese is allied most closely to the Māhārāshtri Prakrit and the Pāli, the most important Middle Indian dialects, and it seems to have come from the northwest of India. The Singhalese differs more from the Prakrit and Pāli than is the case with most of the modern Indian dialects. The change of vowels on account of a following *u*, or *i* ("umlaut"), the entire loss of the aspirates, and the change of *c* to *s* and *j* to *ḍ*, while *s*, whether original or developed, may become *h* or remain unchanged, are noteworthy characteristics of this dialect. In its nominal system Singhalese has become analytic, like the other modern Indian dialects, but in its verbal system it represents a comparatively old stage of linguistic development. There was formerly much discussion whether Singhalese was an Indian or a Dravidian language. It is now, however, generally regarded as a true Aryan dialect, despite the many loan words which have been incorporated into its vocabulary. The older form of Singhalese is called Elu, which is still employed for poetical composition. Dialects of the Singhalese are Maldive and the jargon of the Rodiyas, which seems to be a slang of the standard language. Singhalese is written in a special, graceful character, apparently derived, like the epigraphical letters, from the Brahmi alphabet of the Asoka inscriptions.

Singhalese literature is rather scanty. The oldest monument of it is a glossary to the commentary on the *Dhammapada* in the tenth century. The prose literature is chiefly religious, but there are also grammatical works, such as the *Sidat-sangarāva*, and, what is especially noteworthy in Indian literature, histories, such as the *Dipavansa*. The golden period of Singhalese poetry was in the fifteenth century, when the *Sālahini-sandēśaya* was written. Many of the poems deal with the Buddhist birth stories, or Jātakas, as the *Kusajātaka* of Alagiyavanna Mohottāla or Mukaveti, a poet of the Singhalese Renaissance at the beginning of the seventeenth century. There are many inscriptions in Singhalese, dating from the last centuries B.C. to the nineteenth century A.D. After the fifth century, however, they are comparatively infrequent.

Religion. The prevailing religion of Ceylon within historic times has been Buddhism; it is still the faith of almost the entire southern and central portions, or two-thirds of the island. Hinduism, or the sects of Brahmanism, is confined chiefly to the north. Christianity and Mohammedanism have a considerable representation throughout the land. The census of 1911 gives the following statistics: Buddhists, 2,474,393; Hindus, 939,701; Christians, 410,525; Mohammedans, 284,482. Singhalese Buddhism is the principal representative of Southern Buddhism, which includes also Siam and Burma,

in contrast to the Northern Buddhism of China, Japan, and Tibet. All have their origin, of course, in India. (See **BUDDHISM**; **INDIA**.) The history of the faith as a national religion in Ceylon is reserved in the Pāli chronicles of Ceylon, the *Mahāvamsa* and the *Dīpavamsa*. Tradition claims that Buddha himself visited the island (Lankā) on three different occasions. His sacred footprint, the *śrīpada*, on Adam's Peak (q.v.), is still a place of hallowed pilgrimage for the faithful. The real introduction of Buddhism into Ceylon, however, dates from the third century B.C., when Mahinda, son of the Indian King Asoka, came from India and established the faith under the patronage of King Tissā of Ceylon, a contemporary of the great Asoka (q.v.). Mahinda's own sister, the Princess Sanghamittā, brought from Buddha Gayā a branch of the sacred bo tree, or *Ficus religiosa*, from which the famous tree at Anurādhapura is directly descended. (See **BO TREE**.) The faith thus established entered upon its history in the island. In the fourth century A.D. the great Buddhist scholar and commentator, Buddhaghosa, came from India to Ceylon and by his admirable treatise on the Buddhist doctrines, the *Viśuddhi-magga*, or Way of Purity, set up a standard of interpretation of the sacred texts which has been authoritative since his time. Under Parkākrama Bāhu I, the greatest Buddhist of Ceylon, c.1200 A.D., was the time of the highest prosperity of the faith; but a depression, more or less great, followed later, and Brahmanism, which had contributed more than one admixture from the earliest Tamil invasions and the rule of the Malabar kings, proved a formidable rival. In spite, however, of all opposing claims, including Mohammedanism and Christianity, the title of Buddhism is still paramount, and it has been kept practically free from sects. Three divisions or societies, however, are recognizable. The largest of these in point of numbers, some 50 per cent, and the earliest to develop, is a division due to the influence of Siamese monks who were imported into the Kandyan territory about A.D. 1750 to restore decadent Buddhism. The second, or Amarapura society, was founded about A.D. 1800, when Buddhist missionaries from Burma were introduced. The third, or Ramany branch, represents a somewhat reactionary movement or tendency to stricter conformity to the faith of the ancient books. Only the Siamese society cultivates caste; the other two reject it as foreign to Buddhism, although of ancient origin. There are some other slight points of distinction between the three. In this connection it may be worth noting that Christianity has taken hold largely among the fisher class, who are regarded as among the lowest orders of the community. Hinduism, or Brahmanism, for the most part is the faith of the Tamil or Malabar population of Ceylon; the Moormen are Mohammedans. The first Protestant missionaries that went to Ceylon after the Portuguese and the Dutch supremacies had given place to the British were sent by the Baptists in 1813; the Wesleyan Methodists followed in 1814; the American missionaries entered the field in 1816; and the Church of England came in 1818. The Christian population, however, is mostly Roman Catholic. The progress of Christianity among the people has been very considerable; schools have been established; women's seminaries endowed; and collegiate institu-

tions founded, especially under the guidance of missionaries.

Antiquities. The buried cities and ruins of massive monuments in Ceylon make its antiquities a subject of importance to the student of art, archaeology, and history. These vestiges of early civilization are directly connected with Buddhism as the national faith of the island. In all Buddhist countries the sacred buildings present, with certain modifications, the same general character (see **BUDDHISM**; **BURMA**; **ETC.**), and in Ceylon we find the usual three classes represented by temples (*pansalas*), monasteries (*vihāras*), and relic shrines (*dāgabas*). The latter, from *dā*, *dhātu*, relic, and *gaba*, *garbha*, receptacle, denotes a casket, and then a large structure erected to contain some sacred relic of Buddha. The form of these is bell-shaped, on a square base. They answer in general to the pagodas of Burma and the topes of Afghanistan. The most famous of the *dāgabas* in Ceylon is the Daladā Māligava, the Temple of the Tooth, at Kandy, containing a tooth of Gautama Buddha brought from India to Ceylon about 300 A.D. The original relic was destroyed by the Portuguese, but its substitute, a piece of discolored ivory resembling a crocodile's tooth, is jealously guarded in a sacred shrine and shown only to royal personages or on the rarest occasions. The labor which must have been bestowed upon some of these shrines and edifices in the early ages of the Singhalese monarchy is astonishing. Some of the ruined structures in the half-buried cities of the north of the island almost rival the pyramids of Egypt or other monuments of antiquity in their desolate grandeur. The architectural remains of 2000 years ago, as seen at Anurādhapura, Polonnaruwa, Dambulla, Kalavewa, Mahintale, and Sigiri, are of the greatest interest alike to the traveler and to the antiquarian. The rock-hewn temple of Gal-vihāra at Polonnaruwa, the capital of ancient Ceylon, is much the same to-day as it was when described in the *Mahāvamsa*. The massive pile of the Rankot Dāgaba and the Jetavanārāma Temple, in the same region, with the colossal statues of Buddha here and elsewhere, well repay a visit after Anurādhapura, with its famous bo tree alluded to above. Among the antiquities of Ceylon the ruined tanks must also be mentioned, as they are wonderful monuments; 30 enormous reservoirs and about 700 smaller tanks still exist, though for the most part in ruins. Some of these magnificent works of irrigation have been restored by the government, among them Minneri and the Giant's Tank. Works have been completed for the storage and supply of water for Colombo.

History. There are abundant allusions to Ceylon in ancient writers, and the island appears in early Sanskrit works under the name of Lankā; but no direct knowledge concerning its history was accessible in Europe until about the year 1826. The opening up of the records of Ceylon's early history was due to the labors of George Turnour (1794-1843), who devoted himself to a study of the Pāli chronicles and composed an *Epitome of the History of Ceylon* from the year 543 B.C. to 1798 A.D. His records give the reigns of 165 kings who reigned during this period of 2341 years. He based his work chiefly on the most famous of the Singhalese books, the *Mahāvamsa*, a metrical chronicle, in the Pāli language, which gives an account of the island during the centuries named. The story begins with the invasion of Vijaya, or Wijayo

(543 B.C.), son of a petty Indian sovereign in the country watered by the Ganges. He subdued the Yakkhas, the aboriginal inhabitants; married a daughter of one of the native chiefs, whom he subsequently repudiated for an Indian princess; and founded a dynasty that held undivided sovereignty in Ceylon for nearly eight centuries. He bestowed on his kingdom his patrimonial name of Sihala, or Sinhala—whence Sinhalese (Sinhalese), Ceylon—and promoted the settlement of colonists from the mainland. In the reign of the great King Tissa, called Devānāmpiyatissa, or Devenipiatissa (307 B.C.), Buddhism was established as the national religion, and his reign was further remarkable by the planting of the sacred bo tree (288 B.C.), and now commenced the erection of those stupendous buildings already noticed. The next important epoch in Sinhalese history is the usurpation of the Malabars (237 B.C.), foreign mercenaries from the Coromandel coast, to whom the native sovereigns had intrusted the defense of the island. Several Malabar invasions are chronicled in the history of Ceylon, and these foreigners long contended with the native princes for supreme authority. Passing on to 1071 A.D., a native dynasty was then reestablished in the person of Vijayā Bāhu, and his recovery of the throne delivered the country from the domination of the Malabars or Tamils for a time and prepared the way for the restoration of the royal race nearly a century later in the person of the illustrious Parākrama Bāhu. Parākrama's reign commenced in 1155 A.D., and it was one of the most renowned eras in the history of Ceylon. He devoted himself to religion and agriculture, and besides many notable religious edifices he caused no fewer than 1470 tanks to be constructed, subsequently known as the "seas of Parākrama." Thirty years after the death of this monarch the Malabars landed with a large army and speedily conquered the whole island. In 1235 a native dynasty recovered a part of the kingdom. During the reign of Dharma Parākrama IX the Portuguese first visited Ceylon (1505); but it was in 1517 that they first formed a permanent settlement at Colombo for trading purposes. Their encroachments soon aroused the opposition of the patriotic Kandyan, and it is a remarkable fact that, although they were even ignorant of the use of gunpowder when the Portuguese came, in 1505, they ultimately excelled their enemies as musketeers, and were finally able to bring 20,000 stand of arms to bear against them. "Amity, commerce, and religion" was the Portuguese motto; but their rule in Ceylon is a sad story of rapacity, bigotry, and cruelty. They were at last driven from the island by the Dutch in 1658, after a contest of 20 years, when, as Sir J. E. Tennent remarks, "the fanatical zeal of the Roman Catholic sovereign for the propagation of the faith was replaced by the earnest toil of the Dutch traders to intrench their trading monopolies; and the almost chivalrous energy with which the soldiers of Portugal resisted the attacks of the native princes was exchanged for the subdued humbleness with which the merchants of Holland endured the insults and outrages perpetrated by the tyrants of Kandy upon their envoys and officers." But the purely military tenure of the Dutch was destined to give place to the colonization of the British. It was during the great European war succeeding the French Revolution that the Eng-

lish gained possession of the island. On Aug. 1, 1795, an expedition under Col. James Stuart landed at Trincomalee, which was speedily captured, and finally the garrison of Colombo surrendered, on Feb. 16, 1796. By this capitulation all the Dutch settlements and strongholds in Ceylon were ceded to the English, though the island was not formally annexed to the British crown till the Treaty of Amiens, 1803. The native sovereigns, however, continued in the possession of their mountain territory; but at length the Kandyan King Vikrama Rāja Sinha, after perpetrating the most frightful atrocities on his own people, seized and murdered certain native merchants, British subjects, trading to Kandy. War followed; in January, 1815, Kandy was taken, and the tyrant was sent a captive to the fortress of Vellore. On March 2, 1815, a treaty was concluded with the native chiefs, by which the King was formally deposed and his territories annexed to the British crown. Since then the island has made rapid strides in material prosperity; many important public works have been completed, and others are still in progress.

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CEYLON TEA TREE. See ELÆODENDRON.

CÉZANNE, sā'zān', PAUL (1839-1906). One of the most striking and influential figures in modern French painting. He was born at Aix, Provence, the son of a banker. In the college of his native town he formed a friendship with Emile Zola, whom he followed to Paris, and on whose advice he took up painting. He failed in the entrance examinations to the Ecole des Beaux-Arts, but in the Ecole Suisse, in which he studied, he was associated with Pissarro, who introduced him to the art of Courbet and Manet. As a result, Cézanne joined the Impressionists, exhibiting with them in 1874 and again in 1877, when he sent in 17 oil paintings. Discouraged by the ridicule of critics and by his differences with the Impressionists, he retired in 1879 to Aix, where he spent the remainder of his life. He broke with all his old friends, even with Zola, and seemed forgotten by the world. But in this seclusion he developed a style of amazing originality, which has exercised a profound influence upon the radical younger generation, who hail him as a prophet and a leader. Not until the exposition of 1900 and the posthumous exhibitions of his works did the world realize his importance. For Cézanne differed from

both Impressionists and Academicians. He used the bright colors of the former, but objected to the flat appearance of their pictures, and attempted to render depth and modeling, and in his last works he sought for unity of composition. His aim was to unite Impressionism with the great art of the past, which he endeavored to accomplish by the use of dark shadows and outlines in conjunction with a particularly bright and melting color scheme. He excelled particularly in still life, but was also a great landscape painter, particularly when depicting his native Provence; he painted also forceful portraits and admirable nudes in landscape. His paintings are most numerous in the private collections of Paris. He is represented in the Luxembourg, Paris, in the Havemeyer collection, New York, and especially in the National Gallery, Berlin. The story of Cézanne's struggles and career is depicted in Zola's *L'Œuvre*, of which he is the hero. Consult: Duret, *Les Impressionistes* (Paris, 1906); Faure, *Portraits d'hier, Paul Cézanne* (ib., 1910); Meyer and Graefe, *Paul Cézanne* (Berlin, 1910); Puy, *L'État de la peinture moderne* (Paris, 1911); Burger, *Cézanne and Hodler* (Munich, 1913).

CEZIMBRA, sâ-zêm'brá. A coast town of Portugal, in the Province of Estremadura, about 18 miles south of Lisbon (Map: Portugal, A 3). It has a good harbor and fisheries. Pop. (commune), 1890, 8438; 1900, 9066.

C. G. S., or CENTIMETER-GRAM-SECOND SYSTEM. That system of units or standards for the measurement of physical quantities which is based upon the *centimeter* as the unit of length, the *gram* as the unit of mass, and the mean solar *second* as the unit of time duration. It has been adopted by all scientific bodies, by most governments, and is in daily commercial use at the present time by all the leading nations of the world except Russia, Great Britain, and the United States.

The *centimeter* (cm.) has a length which is the one-hundredth of the distance between two fine lines on a certain platinum-iridium bar kept in Paris at the Bureau International des Poids et Mesures and known as the International Prototype Meter, the length being measured when the bar is at the temperature of 0° C. The *gram* (gm.) has a mass which is the one-thousandth of that of a platinum-iridium cylinder, kept in Paris, known as the International Kilogram. The mean solar *second* (sec.) is an interval of time such that $60 \times 60 \times 24$ of them compose a mean solar day—i.e., the length of time such that 365 of them compose a year.

It should be noted that the meter is nearly one ten-millionth of the distance from the pole of the earth to the equator, measured along any meridian on the earth's surface. Further, the gram has practically the same mass as one cubic centimeter of distilled water at 4° C. (its temperature of maximum density), and at normal atmospheric pressure, for the most accurate results give for this mass 0.99996 gram. A *liter* is the volume occupied by one kilogram of pure water at 4° and at normal pressure.

Various multiples and fractions of these units have received names. (See METRIC SYSTEM.) Thus, 1000 meters is called a *kilometer*; one-tenth of a centimeter a *millimeter*; one-thousandth of a millimeter a *micron*, whose abbreviation or symbol is " μ "; one-thousandth

of a micron, or one-millionth of a millimeter, has the symbol " $\mu\mu$." The other divisions of the meter and those of the gram have the usual decimal names and notations. The words "minutes," "hours," etc., require no explanation. Units for the various mechanical quantities are based directly on the centimeter, gram, and second. Thus, a unit velocity on the C. G. S. system is a speed of one centimeter per second in a definite direction, etc. (See MECHANICS; MECHANICAL UNITS.) A unit force is called a *dyne*; a unit of energy an *erg*; but these units are inconveniently small, and so multiples of them are used in general. A *megadyne* is 1,000,000 or 10^6 dynes; a *joule* is 10,000,000 or 10^7 ergs. The practical unit of pressure is, therefore, 1 megadyne per square centimeter, and is called a *barie*; the practical unit of power or activity is 1 joule per second, and is called a *watt*.

There are also several sets of electrical units (q.v.), based on these mechanical ones, as are also the ordinary units for measuring heat energy and photometric quantities. (See HEAT; PHOTOMETRY.) Consult Everett, *Illustrations of the C. G. S. System of Units* (London, 1902); Hallock and Wade, *Evolution of Weights and Measures and the Metric System* (New York, 1906); Guillaume, *Les unités et étalons* (Paris, 1893).

CHABANEAU, shá'bá'nó', CAMILLE (1831-1909). A French philologist, born at Nontron, Dordogne. His first work, *Nistore et théorie de la conjugaison française* (1868), attracted considerable attention, and he afterward (1879) became professor of the French language and literature of the Middle Ages at Montpellier and collaborator on the *Revue des langues romanes* (1872). In 1895 he was made a knight of the Legion of Honor, and later was the recipient of an honorary doctorate from the University of Halle-Wittenberg. He was not only a leading authority on Provençal philology, but made numerous valuable contributions to the history of Languedoc. Among his works are: *Grammaire limousine* (1876), still the most valuable work on this subject; *La langue et la littérature provençales* (1879); and *Biographies des troubadours en langue provençale* (1885). In 1907 the *Romanische Forschungen* published a very large *Festschrift* composed in honor of his seventy-fifth birthday (March 4, 1906) by his pupils and admirers. This volume contains a complete bibliography of his publications by E. Lefèvre (pp. 1093-1106). For a brief biography, consult necrology by E. Levy in *Zeitschrift für romanische Philologie*, pp. 71-73 (Halle, 1909).

CHABAS, shá'bá', FRANÇOIS JOSEPH (1817-82). A French Egyptologist. Though engaged in business as a wine merchant throughout most of his life, at Châlons-sur-Saône, he became a leading authority on Egyptian archæology. In 1873 he declined the chair of Egyptian language and archæology in the Collège de France. He published valuable translations of hieroglyphic and hieratic writings. Among them are: *Le papyrus magique Harris* (1861); *Voyage d'un Égyptien en Syrie, en Phénicie et en Palestine au XIV^e siècle avant notre ère* (1866); and *Recherches pour servir à l'histoire de la XIX^e dynastie* (1873). Horrack edited (1883) his uncompleted *Choix de textes égyptiens*.

CHABAZITE, káb'a-zít, or **CHABASITE**, káb'a-sít. A hydrous calcium, sodium, and alumi-

num silicate belonging in the zeolite group of minerals. It occurs in rhombohedral crystals with nearly square faces, which give to them somewhat the aspect of cubes. The lustre is vitreous, and the color white or flesh red. Chabazite, like the other zeolites, is generally found in basaltic rocks. It is abundant in several localities in Nova Scotia. See ZEOLITE.

CHABLAIS, shá/blá'. An old division of the Province of Annecy, in Savoy, now the Arrondissement of Thonon, Department of Haute-Savoie, France, bordering on Lake Geneva. It was admitted to the participation in the Swiss neutrality by the "Final Act" of November, 1815.

CHABOT, shá/bó', FRANÇOIS (1759-94). A French Revolutionist, born at Saint-Geniez-d'Olt (Rouergue, now Aveyron). A Capuchin monk, he abandoned the order and identified himself with the Revolution. He was elected to the Legislative Assembly in 1791 and to the Convention in 1792. He joined the Cordeliers Club and became known as a violent extremist. On his motion Notre Dame was made the Temple of Reason; he originated the designation "La Montagne" for the rabid legislators occupying the topmost seats; and he called Jesus Christ "the first sans-culotte." He was accused of bribery and falsification, was condemned with the Dantonists, and, after an unsuccessful attempt at suicide, was guillotined.

CHABOT, PHILIPPE DE, SEIGNEUR (ADMIRAL) DE BRION and COMTE DE CHARNY (1480-1543). A French general and admiral. He defended Marseilles in 1524, and in 1525 was captured at Pavia. In 1526 he became admiral and Governor of Burgundy, and in 1535 commander in chief. In 1541 he was convicted of fraud against the national treasury, on charges preferred by the Constable Montmorency, but was pardoned by King Francis I. He was the patron of Jacques Cartier, and is said to have been the first to suggest the colonization of Canada, to which French adventurers were turned by his suppression of the trade to Brazil. He has a beautiful Renaissance tomb in the Louvre, with a recumbent statue by Jean Cousin.

CHABRIAS, ká/bri-ás (Lat., from Gk. *Xaβplás*) (?-357 B.C.). An Athenian general, the son of Ctesippus. As general in 390 B.C. he took part in the Thracian expedition of Thrasybulus. In 388, while on his way to Cyprus to support King Evagoras against the Persians, he defeated the Spartans at Ægina. In 378, by bringing into operation a new manœuvre—that of awaiting the charge of the enemy with one knee braced against the shield, itself resting on the ground, and with the spear held in position for throwing—he compelled Agesilaus, who had invaded Bœotia, to withdraw without fighting. In 376 B.C. he defeated the Lacedæmonian fleet near Naxos. At this time many islands and towns were brought, through his efforts, into the new Athenian League. In 373 he was general with Iphicrates, and in 369 he fought the Thebans in Peloponnesus. In 367-366 he was charged with treason in connection with the seizure of Oropus by the Thebans, but was acquitted. In 357 he was trierarch at the battle of Chios and was killed while fighting.

CHABRIER, shá/bre'á', ALEXIS EMMANUEL (1841-94). A French composer, born at Ambert. His first success was an operetta in three acts, *L'Étoile* (1877). He next attracted attention as a symphonist with *España* (1883), a

fine piece of instrumentation. *Gwendoline* (1886), another opera in three acts, was first sung in Brussels. His dramatic works include *Le roi malgré lui* (1887), *Briseïs* (1898), *Les muscadins*, and some symphonies, such as *Suite pastorale*, *Marche de cipayes*, and *Prélude et marche française*. Consult G. Servières, *Emmanuel Chabrier* (Paris, 1912).

CHABRIILLAT, shá/bre'yá', HENRI LOUIS (1842-93). A French dramatist and journalist. He was born in Marseilles and in 1866 founded the journal *Le gamin de Paris*. He was director of the Théâtre Ambigu Comique in 1878-82. His works include the operettas: *Mazepa* (1872); *La belle Bourbonnaise* (1874); *L'Éléphant blanc* (1873); *Les trois margots* (1877); *La fiancée du roi de Garbe*.

CHACHALACA, chá/chá-lá'ká (onomatopoeic word). A guan of the genus *Ortalis*, of which several species exist between Venezuela and northeastern Mexico; specifically, *Ortalis vetula mecalli*, the northern or McCall's chachalaca of the Rio Grande valley. See GUAN.

CHACMA, chák'má (Hottentot). A baboon. See BABOON.

CHAC-MOOL, shák'mool'. A name given by Le Plongeon to a statue which he discovered in 1876 in the uninhabited city of Chichen-Itza, Yucatan, and which he supposed to be a representation of one of the olden chiefs, named Chac-Mool, of the Maya Indians. The statue now stands in the National Museum, Mexico; but the accuracy of Le Plongeon's conjectural christening of it is questioned.

CHACO, chá'kó, EL. A territory of Argentina, situated in the northeastern part of the Republic, and bounded by the Territory of Formosa on the northeast, the river Paraná on the east, the Province of Santa Fé on the south, and Salta and Santiago del Estero on the west and north (Map: Argentina, E 8). Its area is estimated at over 52,000 square miles. The surface is even, but sparsely watered. The southern part is slightly higher and is covered with heavy forests of trees, whose wood is of great economic value. Pop., 1904, 13,937. The chief settlement is Resistencia, situated on the Paraná, near Corrientes, and connected by rail with Santa Fé, with a population of about 3500 in 1904.

CHACO, EL GRAN. A name applied to a region of central South America extending northward from the Salado River to about lat. 18° S. and included between the Paraguay and Paraná rivers on the east and the foothills of the Andes on the west. It thus comprises a large part of northern Argentina and western Paraguay and smaller portions of southeastern Bolivia and southwestern Brazil. The Chaco Boreal includes the section north of the Pilcomayo; the Chaco Central, the section between the Pilcomayo and the Bermejo; and the Chaco Austral, the section south of the latter river. The region is a vast plain, undulating in places, but for the most part flat, and sloping gently towards the southeast. Its mean elevation ranges from about 1000 feet on the western edge to 100 feet on the east. The large rivers which cross the Gran Chaco are subject to periodical freshets and inundate vast areas of the low-lying ground. With the subsidence of the waters numerous lakes and swamps are formed which may remain for a greater part of the year. These lowlands are covered with heavy forests and with thickets of vines and bushes,

while the more elevated areas support a luxuriant growth of grasses. A large part of the region lies within the great Tertiary basin of South America and has a sandy or clayey soil. The climate is generally hot, except in the winter months, and the daily range of temperature is extreme. The rainfall is rather low, the heaviest precipitation occurring in summer. Except on the borders, the entire area is uncultivated and thinly populated. A few nomadic and savage Indian tribes live in the interior and have resisted all attempts of the various governments towards their civilization. The hostility of the Indians and the dense, matted growth of vegetation along the streams have been serious obstacles to the exploration of the Gran Chaco. Argentina and Bolivia have undertaken the exploration and development of certain restricted areas, the principal article of value being the timber and especially the quebracho, which is largely exported for tanning. See ARGENTINA; BOLIVIA; PARAGUAY.

CHACONNE, shá'kūn' (Fr., from Sp. *chacón*, usually derived from Basque *chucun*, pretty). An obsolete instrumental form, almost identical with the passacaglia (q.v.). It is built upon a theme not exceeding eight measures, which is held throughout as a *basso ostinato* (q.v.), while the other voices execute a series of variations. It is in $\frac{3}{4}$ time and slow tempo. The form was revived by Brahms, who employs it in the finale of his Fourth Symphony.

CHACORNAC, shá'kōr'nák', JEAN (1823-73). A French astronomer. He was born in Lyons, was a merchant in Marseilles, where he became interested in astronomy, and was astronomer at the Paris Observatory from 1857 to 1863. He discovered several planetoids (1854-60) and published the following works: *Atlas éclipse* (1856) and *Atlas des annales de l'observatoire impérial de Paris* (1860-63).

CHAD, chād, SAINT. See CEADDA.

CHAD, or **TCHAD**, LAKE. A large lake in Central Africa, lying at an altitude of about 900 feet (Map: Africa, F 3). Surrounded by the French dependencies of Kanem and Bagirmi, German Kamerun, and the British possession of Bornu, the lake is within the spheres of influence of these three powers. The size of the lake varies greatly. During the dry season it is said to cover an area of about 10,000 square miles; but the area is increased to 20,000 square miles or more during the rainy season, from July to October. The water is fresh and abounds in animal life, while the surface, except during the rainy season, is thickly covered with reeds and other aquatic plants. Lake Chad receives the waters of the river Shari from the south, the Komadugu-Waube from the west, and the wet-season stream Bahr-el-Ghazal from the east, but is without any visible outlet, and the fact of the water remaining fresh gives rise to the theory that it has a subterranean outflow. The coasts are, with the exception of the northeast portion, very low and swampy. In the eastern part of the lake there are a large number of small islands inhabited by native tribes, numbering perhaps 30,000 individuals. Islands also fringe the west shores. The lake is supposed to have been known to Ptolemy, and it was probably the Kura Lake of the Middle Ages. In modern times it was first visited by Denham and Clapperton in 1823, and later explored by Oberweg in 1851, Barth in 1852, and Nachtigal in 1871-72.

CHAD'BAND, REV. MR. An oily hypocrite in Dickens's *Bleak House*. He delivers impressive lectures to "Guster" and "Joe," the crossing sweeper, on the subject of "terewth" (truth). His wife had been nurse of Esther Summerson.

CHADBOURNE, chād'bērn, PAUL ANSEL (1823-83). An American educator. He was born in North Berwick, Me., graduated at Williams College in 1848, and became professor of chemistry and physics there in 1853. In 1858, without giving up his duties at Williams-town, he taught the same subjects at Bowdoin College and at the Berkshire Medical College. In 1866 he became first president of the Massachusetts Agricultural College, and in 1867 was chosen president of the University of Wisconsin. He was elected to succeed Mark Hopkins as president of Williams College in 1872, but resigned in 1881, and in the following year again became president of the Massachusetts Agricultural College. During all this time he took an active part in politics, sitting twice in the Massachusetts Senate, besides carrying on manufacturing enterprises. He wrote *Natural Theology Lectures on Natural History* (1860); *Relation of the Natural Sciences to the Intellect* (1860); *Instinct in Animals and Men* (1872), and edited *Public Service of the State of New York* (3 vols., 1881).

CHAD'DERTON. A manufacturing town in Lancashire, England, adjacent to Oldham (q.v.). Pop., 1901, 24,900; 1911, 28,299.

CHADRON. A city and the county seat of Dawes Co., Neb., 350 miles north of Denver, Col., on the Chicago and Northwestern Railroad (Map: Nebraska, B 2). It has considerable wholesale interests and an export trade in live stock. Chadron is the seat of a State normal school, and contains a Carnegie library, a city park, and municipal water works. Pop., 1890, 1867, 1900, 1665; 1910, 2689.

CHADWICK, SIR EDWIN (1800-90). An English social and sanitary reformer, born at Longsight, near Manchester. He studied law, but early gave his attention to social and sanitary questions. An article on "Life Assurance" gained him the friendship of George Grote, and one on "Preventive Police," of Jeremy Bentham, whose private secretary he became. In 1832 he received an appointment as assistant commissioner on the first English Poor Law Commission, and to him were largely due the radical reforms made in the system of poor relief. This was followed by his appointment as secretary of the Poor Law Board, in which office and on the Board of Health for 20 years he carried out beneficent reforms. To him England owed its first Sanitary Commission, organized in 1838, and the Registrar-General's office was established through his initiative. He retired on a pension in 1854. He subsequently took great interest in promoting competitive examinations for government offices and indeed in almost all questions of social economy. He was long an active member of the Association for the Promotion of Social Science, and of the British Association for the Advancement of Science. His best-known published work is *The Evils of Disunity in Central and Local Administration . . . and the New Centralization for the People* (1885).

CHADWICK, FRENCH ENSOB (1844-1919). A rear admiral (retired) in the United States navy, born at Morgantown, W. Va. He gradu-

ated from the United States Naval Academy in 1864; served on the *Marblehead*, the *Susquehanna*, and several other vessels; was on duty at the United States Naval Academy from 1872 to 1875, and at the New York Navy Yard in 1879-80. Subsequently he was naval attaché at the American Embassy in London, chief of the Intelligence Office, and chief of the Bureau of Equipment. During the Spanish-American War he commanded the battleship *New York* and was chief of staff for Admiral Sampson, participating in the most important engagements in the Atlantic during the war. From 1900 to 1903 he was president of the Naval War College, in 1904 was commander in chief of the South Atlantic squadron, and in 1906 was retired from active service. His writings on diplomacy and history are considered among the most important of their kind. He wrote: *Temperament, Disease, and Health* (1892); *An Unsolved Problem* (1896); *Causes of the Civil War*, in the "American Nation Series" (1906); *Relations of the United States and Spain, 1776-1898*; *Diplomacy*, vol. i (1909), and the *Spanish-American War*, vols. ii and iii (1911).

CHADWICK, GEORGE WHITEFIELD (1854-). An American composer, born in Lowell, Mass. He studied under Eugene Thayer in America and under Jadassohn, Reinecke, and Rheinberger in Europe, where he went in 1877. Returning to America in 1880, he became organist in the South Congregational Church, Boston, and instructor in harmony and composition in the New England Conservatory of Music, of which he became director in 1897. For several seasons he also was conductor of the Springfield and Worcester festivals. He was elected to the American Academy of Arts and Letters. With the exception of MacDowell, Chadwick is the most important composer America has produced so far. His leaning is towards the highest instrumental forms, which he handles with considerable skill. In the treatment of these larger forms and of his thematic material he easily surpasses MacDowell, while the latter shows a more striking individuality in the invention of the themes themselves. Chadwick's works are: for orchestra—three symphonies in C m, B flat, and F; six overtures, *Rip van Winkle*, *Thalia*, *The Miller's Daughter*, *Melpomene*, *Adonais*, *Euterpe*; Serenade in F; Suite in A; Sinfonietta; for chorus with orchestra—*The Viking's Last Voyage*, *The Pilgrim's Hymn*, *Lovely Rosabelle*, *Phœnia Expirans*, *The Lily-Nymph*, *Dedication Ode*, *Columbian Ode*; chamber music—six string quartets, a piano quintet, and a string trio. His most ambitious work is a lyric drama, *Judith*. Two other works for the stage are the comic operas *Tabasco* and *The Quiet Lodging*. He has also written about 50 songs and compositions for piano and organ.

CHADWICK, JAMES READ (1844-1905). An American gynecologist, born in Boston. He graduated at Harvard University in 1865 and at the Harvard Medical School in 1871. He founded the American Gynecological Society, was its secretary from 1876 to 1882, and became its president in 1897. He became librarian of the Boston Medical Library Association in 1875, and president of the Massachusetts Cremation Society in 1892. His works include: *The Boston Medical Library* (1876, 1903); *The Study and Practice of Medicine by Women* (1879);

Obstetric and Gynecological Literature, 1876-1880 (1881). Consult the sketch of his life by his grandson (Boston, 1905).

CHADWICK, JOHN WHITE (1840-1904). An American clergyman of the Unitarian Church, born in Marblehead, Mass. For a time he was a shoemaker. He graduated in 1864 at the Harvard Divinity School and was in the same year ordained to the Unitarian ministry and installed as pastor of the Second Unitarian Church of Brooklyn, N. Y. He was known as one of the leading preachers of his denomination, of whose most advanced thought he was a representative. His published discourses, including *Some Aspects of Religion* (1879), *Belief and Life* (1881), *Origin and Destiny* (1883), and *A Daring Faith* (1885), have been extensively read and have been characterized as constituting "a noble body of ethical literature." Best known, however, of his literary works, are his collections, *A Book of Poems* (1876; 7th ed., 1885); *In Nazareth Town*; *A Christmas Fantasy and Other Poems* (1883); *A Few Verses* (1900); *Later Poems* (1905). Among his other publications may be cited a biography of Rev. N. A. Staples (1870); *The Bible of To-Day* (1875); *The Faith of Reason* (1879); *Old and New Unitarian Belief* (1894); *Theodore Parker, Preacher, Reformer* (1900); *William Ellery Channing, Minister of Religion* (1903); *Cap'n Chadwick, Marblehead Skipper and Shoemaker* (1906).

CHÆNOMORPHÆ, kē'nō-mōr'fē (Neo-Lat. nom. pl., from Gk. *χαίνομαι*, *chainein*, to gape + *μορφή*, *morphē*, form). An order of birds, embracing the ducks, geese, swans, screamers, and flamingoes and their allies. They are characterized by cranial features in common, being desmognathous, with the palatal bones united across the median line.

CHÆREA, kē'rē-ā, GAIUS CASSIUS. The murderer of the Emperor Caligula (q.v.). He was tribune of the prætorian cohort. With Cornelius Sabinus and others he formed a conspiracy, and on Jan. 24, 41 A.D., the fourth day of the Palatine Games in honor of Augustus, was the first to strike down the Emperor as the latter returned through the palace. On the following day Claudius, who had been proclaimed Emperor by the soldiers, caused him to be executed.

CHÆREAS (kē'rē-ās) AND **CALLIRHOË**, kă-lir'ō-ē. A Greek romance, by Chariton (q.v.). The heroine is married to Chæreas, and soon apparently dies, but comes to life in the tomb. She is carried off by robbers and after various adventures is restored to her husband. The work was printed from the only known manuscript by James Philip d'Orville, at Amsterdam, in 1760, with a complete commentary. It has been translated into the principal modern languages.

CHÆREMON, (kē-rē'mōn) OF **ALEXANDRIA**. Stoic philosopher and grammarian, and custodian of the annex of the Alexandrian Library (q.v.) in the Serapeum. In 49 A.D. he was summoned to Rome, to become tutor of Nero. He was a prince of high rank and deeply interested in the religious history of Egypt, especially of the earlier times. He wrote a *History of Egypt*, of *Comets*, on *Egyptian Astrology*, and on the *hieroglyphics*. He explained the Egyptian religious system as an allegory of the worship of nature. For his fragments, consult Müller. *Fragmenta Historicorum Græcorum*, vol. 3.

